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**RADEON
300-SERIES**
GROUP TEST

**CHEAP
CHINESE**
PHONES ARE COMING





WINNING AGAIN

It's upgrade season

It's all go. This moment in time is one of those special occasions when many good things converge and getting into your PC is truly exciting.

A big part of that is Windows 10. I think we can all safely say that we hated Windows 8/8.1 a whole lot more than is healthy to admit. The damn thing would find a way to annoy you just when you least expected it. That Microsoft could marginalise desktop and laptop PC users will forever be unforgivable. But let's move on, shall we?

I'm thoroughly enjoying poking around Win 10 and finding new bits to experiment with, and enjoying the design all the way. Windows 7 was the same, and it's very nice to be excited to turn your PC on because it feels new, again.

Next up are Intel's Skylake CPUs, and with that the 100-series motherboards. We will have a big breakdown of that next issue, including a group test of the first motherboards, and the initial K-series CPU.

I know there's quite a bit of difference between enjoying a free OS upgrade – which for most of us should be nothing more complicated than granting Microsoft permission to get on with the job – and splashing out a few hundred dollars for a CPU and motherboard combo, and more again for DDR4 memory. Then, building it all, or buying a ready-built system. But hey, that's what we do.

I wish I could be as excited about a new AMD CPU. I really do. Sigh. We have one in this issue, the A10 7870K stacks up reasonably well for value, as AMD CPUs generally have for the last decade or longer, but for sheer processing muscle it's an all-Intel landscape.

Bennett does point out a somewhat interesting aspect in his review (page 42), being that the integrated graphics on the chip support CrossFire, and that you can buy one of the cheaper AMD graphics cards, CrossFire it with the CPU's GPU and in theory exceed the performance of Intel integrated graphics. That of course assumes that your games of choice support CrossFire, which, statistically, they probably don't.

But anyway, back to the excitement. Sexy high-end laptops are our focus in the Labs this month. Each and every one is beautiful to look at, to touch and hold and to use. I took the Surface 3 Pro to Taiwan as my workhorse for Computex, while my colleague Daniel Wilks, the editor of PC PowerPlay magazine and frequent contributor to the game pages here, took the Dell XPS 13. So first, thanks to both companies for allowing that. In the end it was the Dell I lusted after most of all. This is not your father's Dell. The company now spans every segment, high and low, and any detractors are also the sort of person who dumps on Volvo as being dull. It's a tired cliché, and is very wrong.

This time next month we'll be going hard on Skylake and the first motherboards, work on that is underway as I type, it will be a must-read issue!



Ben Mansill
Editor

bmansill@nextmedia.com.au

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- Our tests are performed by experienced reviewers in our Labs in accordance with strict benchmarking procedures
- Our brand new benchmarks have been tailor-made to reflect real-world computing needs
- We put tech through its paces – seriously. From processing power to battery life, from usability to screen brightness, our tests are exhaustive
- We will always offer an honest and unbiased opinion for every review

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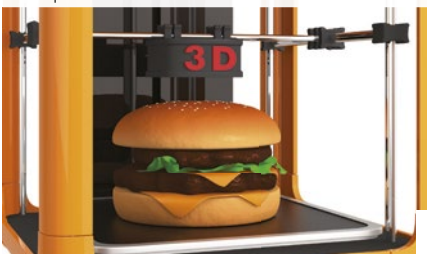
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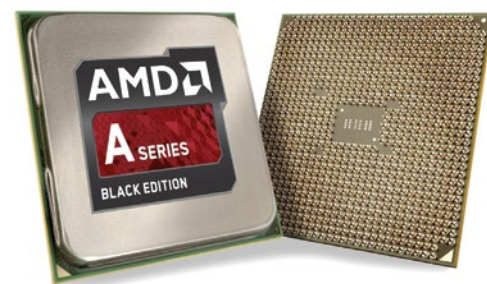
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REAL MECH OR NOTHING

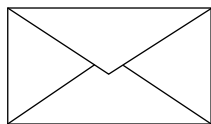
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INBOX

Topical thunder

LEMMINGS BE GONE

I've noted your excellent articles in favour in adopting Window 10, but I have heard nothing about the impending charging regime MS will introduce for support and updates after the 12 month grace period – which I assume applies to every copy? Am I being a luddite here voicing caution about moving to Windows 10 or could everyone else be a Lemming, running over the Windows 10 cliff into an unknown oblivion?

Bob Stimpson

Ben Mansill replies: *We put your good question to Microsoft, Bob. Support and updates will be free for the life of the device Windows 10 is installed on, regardless of when it was installed. It's also our understanding that this applies to each new device (or PC) that you install Windows 10 on.*

PUT THE MAG ON THE DVD?

Like your magazine. For the first time I have checked out one of the enclosed discs. It took a while for Norton to fully scan it which was a bit of a shock. But I wasn't using it any other way, having discovered a virus on another magazine's discs a while back at local society I volunteer with.

I like your quality publication inside and out, I enjoy reading it and learning stuff even if I never will use it.

I looked at subscribing but then that is no fun just waiting for the postie to arrive at the letterbox. I enjoy the walk to local shops where I get to browse in newsagent and see how he has evolved his business. I get to choose if I want two or three IT magazines depending on contents and I am supporting local business too.

What I would suggest is that you include digital copy with the printed

one on the disc you include with the magazine. It would be a way for folk like me to save it to computer to read it on this PC in its tablet form. Also including it could entice a few readers to switch over to the digital version long term.

It would be nice to put it into my computer so when I am at genealogy society and its' quiet I could read it or late at night when I am curled up on lounge chair I could use it on my PC's detachable tablet/monitor. No eye strain.

Suzanne Newton

Ben Mansill replies: *That would be a lovely thing to do, but alas we cannot. The DVD is finalised and sent off for duplication about two weeks before we finish work on the actual magazine, so it would be impossible to put it on the DVD.*

WE WANT OUR FM RADIOS!

I am glad to see there are others out there who have kept their Galaxy S3 because of the FM radio and SD card and removable battery. thought it was just me. Don't get the 4G version of the Galaxy S3 though as it doesn't have a FM radio.

I didn't upgrade to another phone because of the above criteria.

Good magazine keep it up.

Greg Reive

Ben Mansill replies: *It looks like we may have hit a raw nerve with the issue of FM radios in smartphones. The above letter is one of several we have recently recieved on the topic.*

I'm with you. I like a bit of ABC Classic FM on my morning walks. Yes, I know you can stream it (and a great many other radio stations and content sources) via the internet, but the many advantages of FM radio over the internet make it something I wish was more common.

FM radio doesn't need a good internet

connection – or one at all – they are quick and easy to fire up and enjoy and you can listen forever without it affecting your data cap. On top of that there's also the comfort of knowing that you (generally) always have a source of public information if there's no internet for whatever reason.

NEXT-GEN TECH LEADERS

Being a younger reader than most, I have less experience with technology and building computers than some of the others. Thanks to my father I began learning about computers from a young age, and he always supplied me with your mags. They have been great at teaching more about the world of computing and I'm just writing in to thank you for the wonderful work you have been doing, keep it up.

Matt Ricci

IT'S RAINING CLOUD

Your article about cloud disasters is timely. I had a free Adobe account with "workspaces" where you could upload pdfs, then a year ago got an email it was closing. Telstra offered a free T Cloud account with my phone, it too is closing. My Asus netbook, and newer Asus Ultrabook offer free cloud storage, my Acer tablet also offers cloud storage. Flickr offers a free Terabyte for photos, there are a confusing array of options!

Since I have a couple of Windows 8 machines and several copies of Office at home and at work, I have a large free allocation on Onedrive, and since I have Dropbox installed on a number of machines I also get 50GB free there too.

I have unlimited photo backups as well as 15GB free space on my phone, too.

I view these services like bluechip shares, probably as safe in the medium term, but I don't rely on them.

Philip Dawson

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EMAIL: inbox@pcandtechauthority.com.au
Please limit letters to 200 words, where possible. Letters may be edited for style and to a more suitable length.



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Go to www.pcandtechauthority.com.au and join in the conversation. Also check out the Atomic forums: <http://forums.atomicmpc.com.au>

TECH NEWS

The latest trends and products in the world of technology

APPLE CHANGES ITS TUNE ON PRIVACY

Amid a raft of new product launches at the Worldwide Developers

A new version of iOS, a revamp of OS X and the long-awaited launch of Apple Music may have been what everyone was waiting for at the Worldwide Developers Conference (WWDC), but Apple had one more thing to sell to us this year: our privacy.

Personal privacy has become Apple's unique selling point, with new features announced alongside promises to leave data in users' hands. The shift follows CEO Tim Cook's headline-grabbing speech from a few weeks earlier, in which he accused rivals such as Google of cashing in on its customers' data.

With no search-engine business to prop up (unlike Google and Microsoft) and \$200 billion in the bank, Apple can comfortably afford to shun the opportunity to sell customers' data. But does Apple's privacy pledge make its products any more attractive to the end users?

SERIOUS SIRI PRIVACY

At WWDC, Apple announced iOS 9, saying that smart assistant Siri and advanced search tool Spotlight will gain "proactive" intelligent capabilities, knowing what users want before they ask for it. They achieve this feat by sharing data between apps and looking for patterns. Siri, for example, will pull event data from emails into the calendar. If that sounds familiar, it's because such a feature already exists on rival platforms, and Google plans to

✓ Apple CEO Tim Cook is making personal privacy the company's unique selling point



beef up the predictive capabilities of its Google Now assistant in the next version of Android.

Apple may be playing catch-up with such features, but it's taking the lead with privacy, stressing that all personal data will be held on your phone, not its servers. Senior vice president of software engineering, Craig Federighi, stressed that none of the data gathered for Apple's smarter search would be associated with an Apple ID, nor linked with other Apple services or shared with third parties.

"Apple is competing head-on with Google, with iOS 9's proactive intelligence and improved search throughout the iPhone and iPad UI," noted IHS Technology analyst Ian Fogg. "Apple hopes to differentiate by protecting users' privacy, but it must ensure that such protection doesn't cause the intelligent services it delivers to be anything but the best."

The protection of personal data was a consistent message with other new features, too. For example, News is an app with content pulled directly from and curated by top publishers, such as The New York Times and The Guardian. Federighi stressed that none of your individual data will be shared with third parties and what you read won't be linked to other Apple services.

Preventing the free flow of personal data isn't the only privacy measure in iOS 9. Apple's mobile OS will also allow developers to make ad-blocking tools – handy for those who dislike behavioural advertising systems – and will offer an API for virtual private networks.

PRIVACY SALES PITCH?

Apple's striding purposefully towards the moral high ground, but is privacy a consideration for most consumers when it comes to buying a smartphone or tablet? "I don't think privacy is likely to be a major factor in people choosing a handset for a long time, if ever, but it could be a contributory factor, and could certainly be part of a choice of brand or



▲ iOS 9 will feature proactive intelligent capabilities

ecosystem," said Dr Paul Bernal, a lecturer in tech law and privacy at the University of East Anglia. "I suspect Tim Cook's doing a mixture of things here: differentiating Apple from Google is a clear part of it, but it may be more direct in the sense that privacy could become part of the 'coolness' that Apple likes to surround itself with," he added.

Digital privacy is in the spotlight in this post-Snowden era, but it remains to be seen whether Apple can make privacy "cool" enough to counter cutting-edge but invasive features such as Google Photos, which organises photos across devices and understands them well enough to let users search for all the images of them having breakfast, for example.

Benedict Evans, an analyst at venture-capital firm Andreessen Horowitz, suggested in a tweet after Cook's speech that Apple's aversion to data mining may leave it behind – just as BlackBerry was once left in the dust by the iPhone. In 2007, the company then known as RIM stated that nobody would want an iPhone as there would be battery-life trade-offs; now, Apple is saying "no-one wants image search – there are privacy trade-offs," Evans remarked.

In the battle between privacy and features, can Apple win on the former? Bernal said he'd trade in his handset for a more privacy-friendly one, admitting: "I don't think I'm a typical consumer." ●

A VERY SMALL CAMERA

GoPro stakes another claim to owning the action market

Just when you thought action cameras couldn't get any smaller, GoPro releases the latest model in its range, the Hero4 Session. It's half the size of the previous Hero4 cameras at just 1.5 inches cubed, making it one of the smallest cameras on the market, and small enough to fit into nooks and crannies that were previously too small for camera placement.

Despite its shrinking size, the Session is still able to shoot in crisp 1080p HD resolution. We've captured several hours of footage in this mode, and we're impressed by the overall image quality; it's not going to supplant the Hero4 Black as our action cam of choice for beautiful shots, but it's very good considering the diminutive size.

GoPro has also made the Session waterproof without requiring an external case, down to a depth of ten metres. This means that the lens cover could be

vulnerable to scratches, but replacement covers are available from the GoPro store.

We tested the Session extensively at NSW's Perisher Valley, with the one-touch record feature proving its worth, making it easy to start shooting. However, we also found that battery life isn't great when shooting at 720p at 100 frames per second, lasting around 40 minutes or so. And the lack of a replaceable battery means you'll need to carry a charging brick with you.

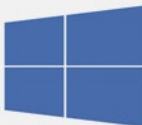
At \$579, this tiny camera comes with a rather large price tag. Still, if you're looking for the smallest possible camera that still shoots beautiful HD footage, the Session is worth a look.



FOUR STORIES NOT TO MISS

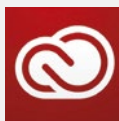
1 MICROSOFT RELEASES WINDOWS 10

Microsoft has released Windows 10, with free upgrades for those running Windows 7 or 8.1. Ongoing updates and support will be free for the life of the device the new OS is installed on, and we are told that this will apply to any new device that Windows 10 is subsequently installed on.



2 ADOBE CC UPDATE

Subscribers to Adobe's Creative Cloud suite have received a host of new features, including a haze removal tool in Lightroom, UI and app design tweaks for Photoshop, and performance boosts for InDesign. Plus, Adobe is finally bringing CC to Android, and added a photo library following its purchase of Fotolia last year.



3 LENOVO'S PC ON A DONGLE

Lenovo has unveiled its first system based on Intel's Compute Stick spec, which crams a full computer into a dongle-sized device. The Ideacentre Stick 300 features runs Windows on a 1.33GHz Atom processor, with 2GB of RAM and 32GB of storage for US\$130. It connects via HDMI to a TV or monitor.



4 AMAZON TO PAY AUTHORS BY THE PAGE

Put a Kindle ebook down without finishing it, and Amazon may not fully pay the author. That's under a new system Amazon is trialling. Amazon pays authors when their books are digitally loaned out, but will now scale that rate based on how many pages readers actually get through.

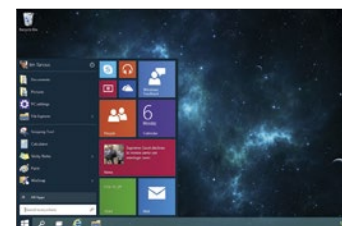


HOT... OR NOT

HOT

WINDOWS 10

Microsoft had it all to do, and managed to score gold with an OS that we can get excited about. It won't ever erase the horrible memories of Windows 8 from our minds, but it is safe to say that Windows 10 is the best PC OS of the modern age, which basically means ever. Even Jon Honeyball loves it.



NOT

WINDOWS 8/8.1

With a bit of effort, and perhaps a few dollars worth of Stardock apps, you can make Windows 8 decent enough to live with on a desktop or laptop PC. But watch as its reputation takes a long-term dive. Windows 8 will be relegated to the dirty words of tech we only ever utter with contempt. Like Windows ME, or Vista.



THE SECRET DIARY OF TIM COOK

We had this incredible vision for Apple Music. We wanted to say hey, come and try this service for three months, and enjoy all the music you love, and you won't have to pay a cent. And neither will we.

It's the kind of innovation that runs in our blood. When we look at the world, we ask ourselves how it could be made better. Last year, more than 500 million iTunes users were able to enjoy U2's amazing album on

day one. That was truly an exciting moment in history, and to make it happen we ended up paying the band \$100 million. So then we thought, how incredible would it be if we could make that magic happen for free?

But sometimes people are invested in their old ways of doing things. And we say, that's great. At Apple, our mission is to help people do the things they love.

Well, it turns out that one of the things

Taylor Swift really loves is getting paid. So we said okay: let's dial back a little and give our friends the space they need to catch up. We've made some changes to our licensing deal, and I know Taylor's going to love being on Apple Music.

Apple has always been about challenging old ideas, and our accountants are going to keep on innovating, and find new ways to charge the world. It's in our DNA.

GAMING NEWS

Rob North covers the highs and lows of this month in gaming

DIRECT X 12 POISED TO LAUNCH NEW GOLDEN ERA FOR PC GAMING

Microsoft's Windows 10 bundled graphics API promises big improvements

Microsoft's long awaited DirectX 12 is finally due to launch as part of Windows 10, and will be available to those who opt into the free OS update as it rolls out globally from 29 July onwards.

The twelfth iteration of the industry standard graphics API, announced over a year ago at the 2014 Game Developers Conference (GDC), is the first major update to DirectX in six years, the longest gap between major versions since its debut in 1995, and will be implemented across PC, mobile and Xbox One.

But what exactly does this mean for us PC gamers, and why should we care?

Well, firstly, DirectX 12 is set to offer significantly improved performance for PC gamers largely thanks to its new threading model that sees the workload distributed across all CPU cores (much like AMD's proprietary Mantle API) rather than lumped on a single core (as was typically the case in previous versions of DirectX). Microsoft developers claim we'll see a 20 percent improvement in frame rate and decreases in power consumption and CPU utilisation.

Hardware manufacturers appear to be equally excited about its potential. In an overview video for DirectX 12, AMD's head of Global Technical Marketing Robert Hallock said the new API offers new

opportunities to substantially improve performance for users of both current and future cards.

"What sets [DirectX 12] apart from its predecessors is that its primary goal is to get huge performance gains out of the hardware that people are buying through much more intelligent use of that hardware," he said.

"Now with DirectX 12 we have a much wider lane of communication between the game, to the processor, and from the processor to the graphics card, and that can result in huge boosts in image quality and performance."

The release of DirectX 12 also coincides with Microsoft's recent noticeable efforts to cater to PC gamers after years of prioritising releases and developments on the Xbox consoles.

The high-profile first-party titles *Gears of War: Ultimate Edition* and *Fable Legends* will both support the new DirectX 12 API when they launch on the PC later this year.

"There have been times in our past where Microsoft has maybe lost our way with PC gaming," said Phil Spencer at the recent inaugural PC Gaming Show at E3, adding that using the DirectX 12 API and Windows 10 OS across Microsoft's multiple platforms will hopefully make the game development process easier.

LOGITECH DROPS THE TECH, INTRODUCES LOGI BRAND NAME

Logitech is dropping the latter half of its name on some new products, which will instead feature the shorter and snappier brand name Logi and a colorful new logo design.

While there was initially some confusion regarding the name change, with some outlets reporting that the company would drop the Logitech name entirely, at a launch event for the Logi sub-brand, Chief Design Officer Alastair Curtis explained that the new shorter brand name and logo will feature on "future facing stuff" (translation: lifestyle products like Bluetooth speakers) while

the full Logitech name will remain the formal company name and will continue to appear on gaming peripherals.

When we last checked in with Logitech things were looking a little grim. The release of new products had trickled to a halt, support for existing peripherals had all but dried up, and the company's Cluster Category Manager for Gaming, Kit Williams, gave a rather cagey answer about future plans. But little did we know, behind the scenes the company was busily innovating and reinventing itself – and this new branding is intended to reflect this development.

logi

BALDUR'S GATE EXPANSION PACK ANNOUNCED

While the original *Baldur's Gate* game was released over a decade ago and the term expansion pack nowadays seems more-or-less reserved for the latest add-ons to *The Sims*, *Baldur's Gate: Enhanced Edition* developers Beamdog have decided to simultaneously breathe new life into the now iconic role-playing game and reclaim the term 'expansion pack' by releasing a massive package of brand new content for the game.

The expansion pack, which will only work with the *Enhanced Edition* re-release from 2012, is titled the *Siege of Dragonspear* and is set add around 25 hours' worth of story and gameplay, filling the gap between the first two entries in the series, as well as a brand new class called the shaman, four additional companions, and a revamped user-interface.

Though there was no listed release date at the time of writing, it won't take much convincing to get us back into the world of the *Forgotten Realms*.

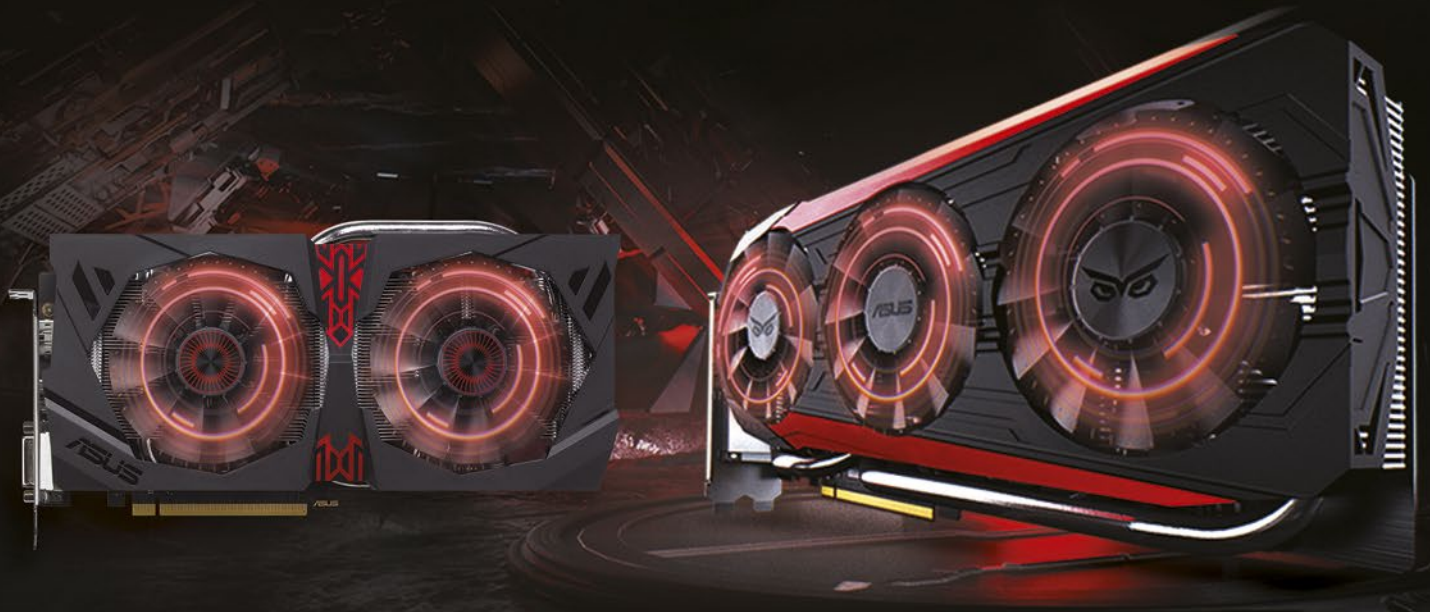
GOODBYE, SATORU IWATA (1959 - 2015)

Nintendo President Satoru Iwata sadly passed away last month after battling cancer for over a year.

Iwata, who began his career at HAL Laboratory as a programmer working on games in the *Super Smash Bros.* and *Pokémon* series, joined Nintendo in 2000 and succeeded Hiroshi Yamauchi as president in 2002.

A self-described gamer at heart and one of the most popular figures in the gaming, Iwata received an outpouring of respect and tributes from rival executives, major studios and prominent industry figures in the days and weeks following his death. Iwata-san, though it may have been a while since we played a Nintendo game, your presence and enthusiasm for gaming will be missed.





RADEON R9 300 SERIES GAMING GRAPHICS CARD

30% COOLER. 0dB GAMING



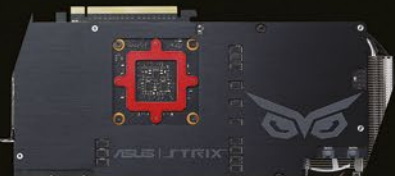
EXCLUSIVE DIRECT CU III TECHNOLOGY WITH 10MM HEATPIPE
30% cooler and 3X quieter performance than reference card



PATENTED TRIPLE WING-BLADE 0dB FANS
Max air flow with 105% improvement in air pressure over reference card for cooler performance



AUTO-EXTREME TECHNOLOGY WITH SUPER ALLOY POWER II
Premium quality and best reliability



STRIX BACKPLATE AND GPU-FORTIFIER
Relieve physical stress around the GPU for upgraded protection



STRIX PULSATING RED/WHITE LED LIGHT
Add cool style to your system



GPU TWEAK II WITH XSPLOT GAMECASTER
Intuitive performance tweaking and instant gameplay streaming

CHIP NEWS

Tock-tock? Intel skips a beat on its way to 10nm, and why is AMD Furiously whining while at an all it can eat HBM buffet? **Mark Williams** covers the latest in Chip News

CPU

AMD INSIDE 3RD CONSOLE?

In a recent earnings call AMD announced that it recently had a third x86 semi-custom design win. With the other two now known to be in the Xbox One and Playstation 4, this has led to speculation that this new design win might be for the upcoming Nintendo NX console. Nothing is confirmed at this stage but this seems like a strong contender.

INTEL TOCK-TOCK

Intel's upcoming Skylake products to be released in August is the result of its tick-tock strategy, which has been in use since 2007. Essentially, each year Intel releases a new product range and the areas of focus for improvement each year alternate. Ticks one year, Tocks the next. Ticks are changes (typically die shrinks) in manufacturing process nodes, and Tocks are usually more focused on architectural changes to the CPU logic itself.

This strategy has allowed Intel to aggressively advance its CPU offerings year over year.

For the first time however Intel has been forced to skip a beat in this strategy by putting off its future (tick) shrink of Skylake, codenamed Cannonlake.

Due to the long delay in implementing 14nm with Haswell and Intel foreseeing that 10nm will be just as troublesome, Intel has decided to push back Cannonlake to late 2017 and insert another Tock for release next year, which has been dubbed Kaby Lake.

Intel has stated that it intends to return to a regular tick-tock cadence with Cannonlake.

SKYLAKE LAUNCHING

Intel's newest product line-up launches early August. Codenamed Skylake, it succeeds Broadwell and ushers in new architectural improvements.

From what we can find it appears there'll be ten SKU's coming at launch, falling into three TDP ranges, 95W, 65W and 35W.

The top end unlocked i7-6700K and i5-6600K will have our attention, with early leaks reporting an apparent 5% improvement for CPU-oriented tasks and 10-20% for iGPU related ones.

We'll have full coverage for you on these in the next issue.

> Intel's release schedule has been thrown into disarray by the late Broadwell CPU and problems shifting to a 10nm process



GPU

GTX 950

Nvidia's newest card, rumoured to be released imminently, is designed to go head to head with AMD's new R7 370 offering.

Little is known specs-wise at this stage but one can confidently presume some more CUDA cores will be disabled compared to the GTX 960 and with Nvidia's inbuilt redundant memory links we can presume that the ROP and on-board memory counts will remain similar as well.

After the GTX 970 3.5GB memory debacle Nvidia will likely play it safe and keep the memory subsystem relatively simple and not implement a two tier memory system.

2GB and 4GB versions are to be expected at launch.

The older GTX 750 and 750 Ti models won't be replaced by the GTX 950 though. With still quite good performance on offer, they may well just get a price cut to bring them into direct competition with AMD's R7 360 offerings.

AMD HAS HBM2 PRIORITY

After a seven year partnership with Hynix producing the new High Bandwidth Memory (HBM) now found on AMD's Fury cards, it has been revealed that AMD not only have a deal with Hynix for total HBM1 exclusivity (hence why no one else has HBM products at the moment) but that AMD also has a priority production capacity agreement ensuring they get first dibs at the second generation of the new memory, HBM2.

With Nvidia's next generation Pascal processor already flagged to use HBM2, this news puts the brakes on Nvidia's next generation launch next year as they will have to wait for spare HBM2 volumes before they can start making Pascal based cards.

It seems AMD will have the upper hand time-wise next generation.

FURIOUSLY WHINING

Reviewers and early adopters of AMD's Fury X have noticed that the card emits an annoying whine when it's on.

First thought to be coil whine, which is an often valid claim on high end cards, the constant steady nature of it led owners to believe it was the pump for the water cooling as being the culprit.

AMD acknowledged the flaw and immediately had Cooler Master (the company providing the cooling solution) revise its solution by adjusting the sound-baffling adhesive compound on the pump itself.

Those who have received the updated versions report that it has solved the problem completely.

Thankfully this was detected early on and only very early review samples and production units were effected. You can check if your Fury X has the new pump by removing the card's faceplate (which doesn't void warranty) and check for an all silver Cooler Master sticker there on the pump.

AMD is also authorizing free warranty replacements for those with the old version. You can tell if that's you if your Fury X has a multi-coloured sticker on the pump.

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MOST WANTED

New things that tickle **Rob North's** fancy

Here Active Listening

Connected to an accompanying smartphone app, Here Active Listening is an amazing piece of wearable tech, two discrete looking wireless earbuds to be precise, that offers you control over the sounds coming into your ears.

MOST WANTED: Developed by Doppler Labs, equipping Here Active Listening essentially transforms you into your own personal audio-engineer. You can adjust the volume of what's coming into your ears in near real-time, and modify certain frequencies to eliminate specific sounds like crying babies - live the absentee parent dream without ever leaving the house!

NOT WANTED: While we won't be seeing the first shipment until December, and those initial units will be going direct to Kickstarter backers, there are two big factors that may limit device's usability: the echo-like sensation experienced when you talk while your ears are blocked known as the occlusion effect (block your ears with your fingers, speak out loud, and you'll see what I mean), and the six-hour battery life.



House of Marley Liberate XLBT

When it comes to headphones generally you're going to get more bang-for-your-buck avoiding the fashionable heavily marketed brands. But if you're a sucker for style, House of Marley's headphones are a great choice.

MOST WANTED: The silver-metallic/leather-brown 'Saddle' (pictured) and the black-on-black 'Midnight' colour schemes both look fantastic, tiptoeing that fine line between fashionable and pretentious. You can feel good about yourself wearing them too, as the wood is certified renewable and sustainable, while the headband is made from recycled aluminium - maybe I'm just a sanctimonious young Millennial but I think that's pretty damn commendable.

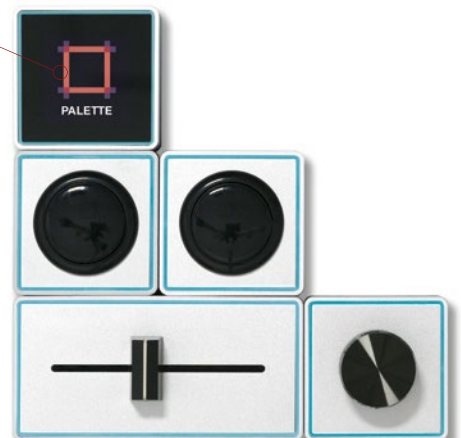
NOT WANTED: The ethical man's Beats by Dr. Dre, House of Marley's headphones are a little bass heavy, but if that's your thing so be it.

Palette

Palette is a crowdfunded modular controller set primarily intended for use by creatives. Currently integrated with major applications in the Adobe Creative suite, the magnetically joinable arcade style buttons, knob dials and sliders can be configured to give you customised tactile control in the place of a mouse and keyboard.

MOST WANTED: Consider how much you could increase your productivity in Adobe Lightroom, for example, if a real-world dial controlled colour balance and a slider could quickly alter levels. There's also a beta joystick mode for gaming, which could offer a more realistic experience for sim fans.

NOT WANTED: Currently available as a wired setup, it would have been nice to see a Bluetooth option. It's also a little pricey and only available in kits for the time being, starting at USD\$199 for a dial, two buttons and a slider.



DxO One

Following in the footsteps of Sony's DSC-QX100, DxO ONE is a pocket-sized 20 megapixel DSLR camera that attaches to an iPhone and uses the touch-screen as a display and viewfinder.

MOST WANTED: It rivals low-end DSLR cameras, with great low light sensitivity, aperture range and shutter speeds, and can also capture 1080p video. It even has its own battery and MicroSD card slot to avoid draining your phone of power and storage space.

NOT WANTED: If you can cope with using your native smartphone camera for happy snaps and lugging along a bulky DSLR for special occasions, it'll be hard to justify investing in this middle-ground solution with a US\$599 price tag - that's roughly the same price as the Nikon DSLR D3300, a great first camera for amateur shutterbugs.



LED Lenser F1R Torch

What do you do when you've got a world-class small flashlight and you want to make it even better? If you're the bright, enlightened boffins at LED Lenser the answer is simple - make it rechargeable.

MOST WANTED: Compact, durable and extremely light, this new rechargeable version of the LED Lenser F1 torch can blast a whopping 1000 lumens of light into the darkness at its highest setting for up to three hours with an effective range of 160 metres. That's off one rechargeable lithium battery (CR123A), mind you.

NOT WANTED: While I can't personally find much at fault with the LED Lenser F1R Torch, it should be noted that the flashlight community (yep, that's a thing) aren't huge fans of the LED Lenser brand compared to its competitors.



Ruark Audio R1 MK3 Tabletop Radio

Ruark is well known amongst audiophiles for delivering well designed quality speakers. Its latest model pint-sized radio lives up to these high expectations, building on the strengths of its predecessors, most notably swapping out the LCD screen for a sleek OLED display.

MOST WANTED: It's a pocket-sized audio-powerhouse despite its single output point, and can also double as a Bluetooth speaker if you're tired of hearing the same radio hits 20 times over. It even has a USB port so you can keep whatever device you've got your music stored on charged. If you're looking for something that will fit in with your existing furnishings the neutral black or white veneers are safe bets, but the walnut finish is my personal favourite - it's like an antique wireless without the unpleasant snap, crackle and audio-pops.

NOT WANTED: While the diminutive design would suggest portability think again. Unless you purchase a battery pack for AU\$99 it'll need to stay hooked up to mains power.



MSI X99A GODLIKE Motherboard

Featuring eye-catching RGB lighting (yes, that's right, on a mother-flipping motherboard), MSI's high-end GODLIKE motherboard first seen at Computex is finally available to we mere mortals.

MOST WANTED: You know what, leaving aside the adolescent impulse to hold down the shift key as they were deciding on a name, MSI were right to dub this beast GODLIKE. It features Killer Doubleshot-X3 Pro with dual Killer NICs for better online performance, an Audio Boost 3 PRO onboard sound, and high-speed storage through Turbo M.2, Turbo U.2 and USB 3.1 ports (both Type A and Type C connectors).

NOT WANTED: What I can't understand is why, after chucking customisable RGB LEDs all over it, obviously aware that for many this would be a vanity motherboard, MSI chose to cover it in the trademark red and black, thus leaving the only suitable colour combos those that complement the brand livery.

THE PROS AND CONS OF GREY IMPORTING

Anthony Caruana wonders if the cheap way is the right way?

We all love a bargain and the internet lets us feed our craving for instant shopping gratification. But there are times when an item we want is either not available locally or the local price has been jacked up because a local reseller is buying the item retail, shipping it here and then adding their own costs and margin to the price.

The answer to this is to enter the world of grey imports – where you become the importer of an item that is not otherwise available or affordable. So, what are the hidden perils and what are the benefits?

WARRANTIES AND SUPPORT

Australians are quite well protected under local consumer laws. When the Australian Consumer Law came into effect in 2011 we were given all sorts of protection against defective items including protection when manufacturer warranties expire but an item can be reasonably expected to still work.

Those protections are important but they come at a cost with every item we buy, having a premium added in order to cover the cost of defects. It's how manufacturers and distributors insure themselves against defects.

When you buy an item from overseas you may not be afforded the same protection.

QUIRKS IN THE SYSTEM

There are some curious anomalies when it comes to support for overseas purchases. For example, some camera companies offer international warranties on lenses but only local warranties on bodies.

At the very least, if an item arrives but doesn't work as expected you could end up having to cover return shipping of the defective item. Depending on

what you buy, you may see the entire saving evaporate at that moment.

If the item you import is defective in some way you might find local repairers unable to help you out if there's a problem. With many name-brand smartphones this isn't an issue with spare parts like displays readily available. However, if you buy a model that isn't available here and have a hassle it may be harder to get a part.

The bottom line: before you buy from overseas, think about what will happen if something goes wrong. If you're prepared to wear the risk, then that's fine. But if you're looking to save \$100 on a \$2000 item you might want to weigh up the benefit of the grey import.

COSTS AND GST

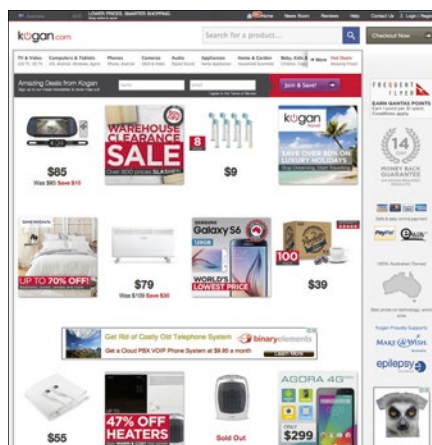
If your motivation for buying offshore and importing is financial, then make sure you understand the rules as you can get slapped with extra fees as the item arrives into Australia.

Purchases made overseas and imported by individuals are subject to rules enforced by the Department of Immigration and Border Protection. The rules are straightforward.

If the items are worth \$1000 or less there are no duties, taxes or charges to pay. If the goods are worth more than \$1000, you will need to fill out a special form called an Import Declaration, and pay duties, taxes and charges.

The emphasis here is on the word

✓ Sites like Kogan.com offer some grey-import products with a considerable cost saving



“Before you buy from overseas, think about what will happen if something goes wrong.”

'worth'. Purchasing a \$5000 camera and declaring its value to be \$999 in order to skimp on paying taxes could land you in hot water. And, if the item arrives and you decide to return it after paying the duty – you won't get a refund according to the Department. However, there is a drawback system so the duties paid on returned items can be used as credit towards duties on future imports.

If you're planning an overseas trip, then the Tourist Refund Scheme might be the easiest way to get your item cheaper without resorting to the grey market. If you buy an item, let's say it's a laptop, through local channels you can get a refund on the GST as you leave the country, saving you 10% and avoiding the potential challenges of local support and warranties.

USE PROTECTION

If you use a credit card for your purchase, it's possible your credit card company offers some form of purchasing insurance and warranty protection. Some cards even offer refunds on purchases if you find the same item cheaper within a defined time period.

If you use PayPal for your purchase, then you can avail yourself to the dispute resolution process which is offered by the company, should your item not arrive or be defective or dead on arrival.

NEED HELP? EVER HAD AN ISSUE AS A CONSUMER? INVESTIGATOR CAN HELP.

If you've had an issue or had something happen and you think investigator could help, email your problem to investigator@pcandtechauthority.com.au



Anthony Caruana
has worked for almost every major masthead in the Australian IT press. As an experienced IT professional – having worked as the lead IT executive in several businesses, he brings a unique insight to his reporting of IT for both businesses and consumers.

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GOING PRO:

Walk into any Qantas business lounge and you're unlikely to find seats occupied by the self-employed. Instead, they'll be filled by the employees of large corporates, running up the bill on the company credit card. So why should sole traders and freelancers go to the expense of business class when it comes to software or services?

Certainly, the companies do everything to warn you away from "consumer-grade" products. Everything from Windows to antivirus, from broadband to webmail, adds a premium for "pro" or "business" versions that vendors tell business owners they're foolish not to buy.

If they can't convince customers to pay for the business-related extras through choice, they'll try to bully them through dubious licensing conditions. That copy of Office 365 Personal you bought for your home laptop? The T&Cs say you shouldn't be using it, for anything work-related, even just working from home for a day.

Same goes for the PowerPoint iPad app you downloaded from the App Store.

Yet, if you're prepared to risk the infinitesimal chance that you'll be prosecuted for using the wrong version of Office, is there any good reason to pay for premium business software?

We've been talking to the companies selling these premium services to find out if there's anything that can justify the cost.

PAYING FOR PRO

Microsoft recently confirmed that Windows 10 will follow the pattern of every release since XP, with a Pro edition to accompany the Home versions of its operating system. What's the difference between the two? Zero, at least in terms of the codebase. But Microsoft locks some potentially business-critical features in the Pro version to ensure it gets a pound more flesh from professional users and corporates.

The good news: few of these features are of much use to homeworkers or micro-

“Does a business broadband connection offer greater peace of mind, or is it just the same wire with a -per-month surcharge?”

RIP-OFF or THE SENSIBLE CHOICE?

IT'S OH-SO-TEMPTING TO OPT FOR FREE SOFTWARE WHEN RUNNING A SMALL OR SINGLE-PERSON BUSINESS, BUT ARE THE "PRO" SOFTWARE AND SERVICES WORTH THEIR PREMIUM? **BARRY COLLINS** INVESTIGATES

businesses. You'll need Pro to join a domain, unlock some network-management features and take advantage of BitLocker encryption, but most small-business owners can live without those.

However, it most certainly does pose a problem for those planning to take their own devices to work. As Microsoft's own literature states: "If you allow users to connect their BYOD devices running Windows 8.1 to your network, your organisation probably requires them to join the domain. Domain Join requires Windows 8.1 Pro or Windows 8.1 Enterprise." Few consumer laptops are sold with Pro versions of Windows, meaning companies will either need to foot the bill for Pro Pack upgrades (around \$200) or have no control over the BYOD devices on their network.

The situation is even murkier when it comes to Microsoft's other software cash cow: Office. Again, there are home and more expensive business subscriptions for Office 365. A freelancer working from home

might be attracted by the Office 365 Home package, for example, which allows them to install all of the key Office applications (including Outlook) on up to five PCs. They might even get away with the Office 365 Personal tariff, which gives a single installation for only \$9 per month.

Yet delve into the terms and conditions and you'll find that this isn't allowed. "The service/software may not be used for commercial, non-profit, or revenue-generating activities," state the software licence terms for the Home, University and Personal editions of Office 365. By the letter of the licence agreement, you can't even bring work home from the office. Someone really needs to inform Microsoft's own support staff. We asked the online chat facility on the Office 365 subscriptions page if we could "use Office 365 Personal for working from home" and the advisor replied: "Yes, that is possible". Possible, but frowned upon.

It's not only the full-blown PC apps



“Security software vendors often state in their EULAs that their product is not to be used for commercial purposes”

that aren't meant to be used for business purposes; the same goes for the Office iPad apps. The blurb on Word's App Store entry promises you can “pick up where you left off” and “rest assured that you don't lose your work while you're on the go”, but click on the licence agreement and you're told that your usage rights permit you to “create, edit or save documents for non-commercial purposes”. Even if you've signed in with an Enterprise subscription!

Does Microsoft have any hope of enforcing such conditions? Is there anything to stop homeworkers or micro-businesses from working with Office 365's Home packages, which have all the features that most professional users would need? We spoke to Julian Heathcote Hobbins, general counsel at the Federation Against Software Theft (FAST), of which Microsoft is one of the most prominent members. Hobbins said he hadn't specifically studied the licensing terms on Windows and Office products, but “if you pay for something, you really ought to play by the rules”.

However, he conceded that anti-piracy organisations such as FAST are

predominantly concerned with commercial pirates and companies that are running numerous instances of a single licence, not picking on paying customers who might be breaching a technicality in the licence agreement. “My hunch is a big, well-known household name isn't going to crack down on its customers,” Hobbins said, adding that he hadn't been instructed by any of his clients to take action against customers who have used home licences for professional purposes.

A Microsoft spokesperson told *PC & Tech Authority* that the company “advises sole traders/small-business owners to use the Office 365 business plans because they're specifically designed for professional use, and are simply a better fit for businesses”. The company also reiterated that the Home and Personal Office 365 subscriptions were only “licensed for personal use” and that “by signing up for a plan, each customer is agreeing to the terms and conditions of that plan”.

It's not only Microsoft that uses its terms and conditions to freeze out businesses. Security software vendors often state in their EULAs that their product is not

to be used for commercial purposes, but the owner of an online software store – who asked not to be named – told us that vendors don't care about micro-businesses using home products for work. “If you have a small business or a home office, you're more than welcome to use off-the-shelf security software, as an example, on a PC you use for business,” he told us. “I have four people who work for me, only one in this office. On his computer, I've installed my own admin login and Kaspersky Internet Security, which also works on his user account. This is fine under the EULA, as I own and control this computer and it's within the three-PC licence agreement.”

Similarly, some small-business owners might be tempted to go for the cheaper Photoshop Elements (available for as little as \$99 online) rather than full-blown Photoshop (\$19.99 per month), if they're only looking to do the occasional piece of

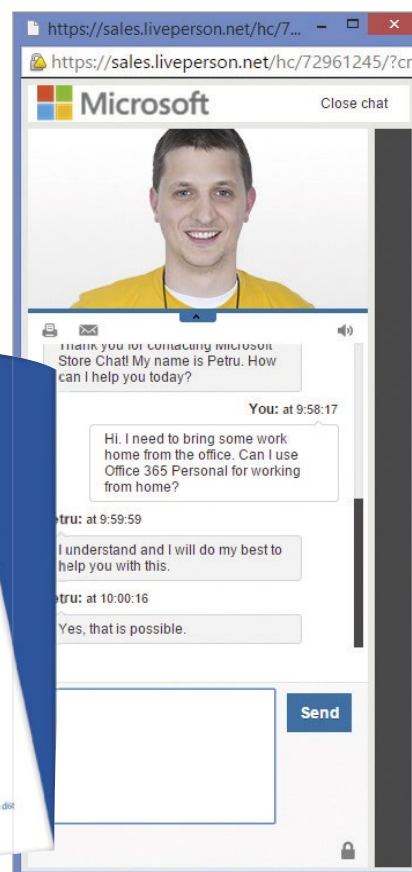
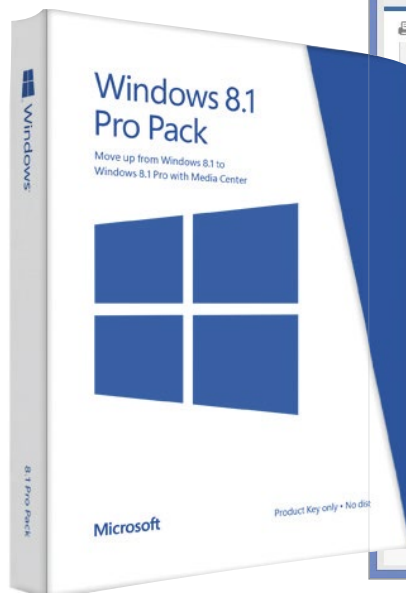
WHAT ABOUT YOUR WEBMAIL?

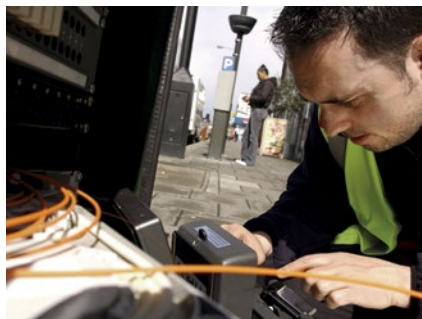


It's fairly common to pass plumbers' vans and see business ads with Gmail contact addresses. What's Google's take on consumer services being used for work? “If you are using our Services on behalf of a business, that business accepts these terms,” Google's general service terms state, before going on to waive any “liability or expense arising from claims, losses, damages, suits, judgments, litigation costs and attorneys' fees”. In other words, do what you like, but don't blame us if you lose business because your webmail goes down. And although Gmail for Work offers professional features such as using your own domain, Exchange migration and 99.9% guaranteed uptime, the maximum compensation you can get from Google if your paid-for business email does go down for prolonged periods (more than 5% of the month) is 15 days' credit.



- > Can you use Office 365 Personal to edit work documents? Chat assistant says yes, licence says no
- ✓ Windows' “pro” features cost an extra \$19.14 per user/month





^ The time you're most likely to appreciate a business broadband package is when something goes wrong, with faults repaired within a working day

photo retouching, not least because the Expert tab contains many of the same features as its professional-grade sibling. Ditto Premiere Elements for video editing.

We can find nothing in Adobe's sprawling EULA for these packages that overtly bans business use, but there is a worrying clause for business owners that, once a year at a week's notice, gives Adobe the right to "inspect customer's records, systems, and facilities to verify that its installation and use of any and all Adobe software or service is in conformity with its valid licences from Adobe".

PROCEED AT YOUR OWN RISK

Ultimately, running consumer software or services instead of business variants comes down to your appetite for risk. The cheaper Home versions of Windows, Office or security suites will contain all the features most sole traders or micro-businesses need, and the chances of vendors such as Microsoft sending round the licensing cops seems remote, bordering on non-existent. ●

"If you have a small business or a home office, you're more than welcome to use off-the-shelf security software"

FIVE WAYS PROS CAN SAVE MONEY ON SOFTWARE

1 TAKE A FREE TRIAL

Free trials are great if you only need an application for a short period of time. For instance, Adobe offers 30-day free trials of any of its Creative Suite applications, so you can benefit from the power of Photoshop or others without handing over credit-card details.



2 BUY AN OLD VERSION FROM WHICH TO UPGRADE

Many professional software packages offer substantial discounts to upgraders. If you can pick up an earlier version from eBay or elsewhere, you can benefit from the upgrade price. There's an element of risk here: you need to ensure the licence hasn't already been used for an upgrade. Ideally, buy unopened older versions rather than second-hand.

3 TRY A BETA APP

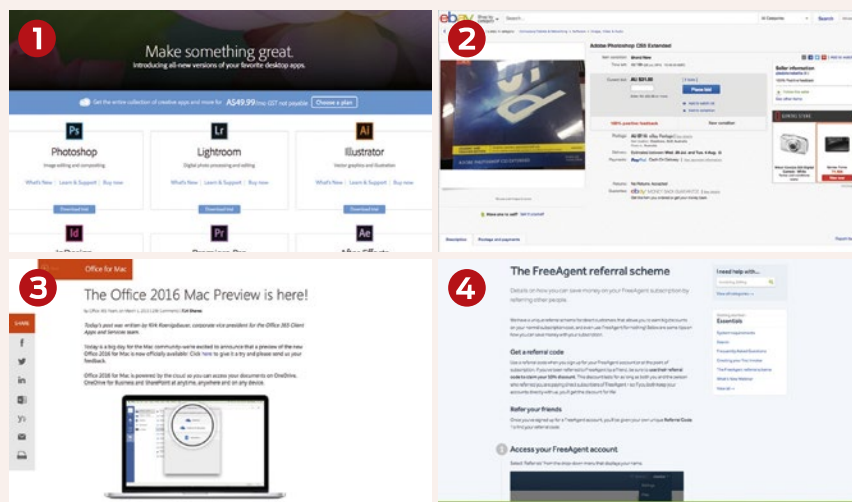
Anyone who says you can run a business entirely on beta software is talking out of their USB port. A mission-critical system isn't the place to test Windows 10 or Office 2016. However, if there's a specific, limited function you need, a beta product may give it to you for free. Betabound (betabound.com) rounds up current betas, which at the time of writing included video converters, a service allowing content owners to spot copyright infringements and other business apps. You might just find a freebie that does a job you need.

4 TAKE ACADEMIC PRICING

This one falls under "iffy, but very unlikely to get your collar felt". Many software vendors offer sizeable discounts to students and teachers. Adobe, for instance, offers 65% off Creative Cloud subscriptions, bringing the price down from £45.73 to £15.49 per month. If you've got a teacher or student in the house and you work from home, you're quids in.

5 USE REFERRAL CODES

Some professional packages offer a discount or extra features for encouraging others to join. Accountancy software provider FreeAgent offers a 10% discount for the lifetime of your subscription for every new subscriber you refer – refer ten and it's free! Online backup service Livedrive gives you three months' free service for every referral, and many others do likewise.





LIVE LONG

How health technology can change your life



AN EXPLOSION OF HEALTH-TRACKING TECHNOLOGY IS PUTTING US IN CONTROL OF OUR OWN WELLBEING – AND TRANSFORMING THE MEDICAL PROFESSION

CONTRIBUTORS: STEWART MITCHELL, DARIEN GRAHAM-SMITH, LISE SMITH, DAVE STEVENSON

A longer, healthier life is part of the promise of technology. Science and medicine have always progressed together, ever since humans began to develop plant-based remedies. But the arrival of wearable sensors is perhaps the most revolutionary development in the history of medicine.

That's partly because it upsets the traditional patient-doctor relationship. In the past, monitoring and diagnosing an individual's health were the preserve of the medical professional. Today, apps and devices that track your fitness and measure your vital signs put that information in the hands of the patient.

The implications of this are huge. First, constant monitoring means that potentially dangerous conditions can be identified at the earliest possible stage. "Technology is emerging that not only measures how much exercise you do, but complex changes to your physiology, such as your heart rate, your respiratory rate, and whether you have excess fluid in your body," Sir Bruce Keogh, a medical director, told us.

"In the future, people with conditions such as

diabetes, heart disease, liver disease or asthma will wear devices, skin sensors or clothes capable of detecting deterioration, bringing this to the attention of the healthcare professionals through their mobile phones."

Health technology can be transformative on a larger scale, too. The growing availability of medical data is enabling initiatives to build platforms that can collate the data from entire populations to improve diagnoses and ongoing care.

Yet, at the same time, putting health technology into consumer devices and uploading it to online services raises knotty problems. Who ends up with access to the data? How can patients' privacy be protected? And indeed, how far should consumers rely on all this new technology?

LIFESTYLE OR SERIOUS MEDICINE?

Most current fitness devices detect your activity and track simple health metrics, such as temperature and heart rate. With plugins, some can also add extra

measurements, such as weight and blood-pressure readings.

Linking these readings to rewards programmes and social-media sharing represents a “gamification” of health that, manufacturers argue, encourages people to persevere with healthy activities. While some may see tracking such information as an exercise in self-congratulation for fitness fanatics, medical experts insist that far from being a gimmick, the motivation provided by tracking apps is invaluable and could prevent, delay or help treat certain medical conditions.

“After a heart attack, raising physical activity levels and improving your diet is just as effective as any drug in preventing a second heart attack,” said Professor Iain Buchan, clinical professor in public health informatics at the University of Manchester.

“Combining care for health with wellbeing interventions holds great promise for big improvements in health outcomes, beyond the reach of the clinic. The same applies to tackling public health problems such as obesity: top-down, state-run interventions don’t work, and medicalised interventions aren’t sustainable or practical. There’s a need for citizen-driven approaches that tap into our daily rhythms of eating and overall physical activity.

“Consumer health technologies are showing promise as they transition from toys for the worried to ubiquitous kit. For example, I can now buy a wristwatch with an eight-month battery life that



measures my physical activity and talks to my smartphone or other ‘hub’, without my having to feed it with power or user input. It nudges me into a healthier energy balance or sleep habit when I’m open to persuasion,” he said.

By promoting fitness, such personal devices can stave off many conditions and health issues, and health industry bosses believe that apps and consumer tech will play an increasingly central role within healthcare services in the coming years. With growing patient numbers, an ageing population and budget cuts all adding to

“THE PATIENT AND MEDICAL STAFF DON’T WASTE TIME ON ROUTINE TESTS WHEN INTERVENTION ISN’T NEEDED”

the pressure on health services, the idea of cutting costs and waiting lists while improving public health is a very attractive one indeed.

Another benefit for doctors and hospitals is the potential for medical conditions to be monitored remotely; apps and tools on smartphones or dedicated devices can monitor illness-specific data, and feed it back to doctors. The patient and medical staff don’t waste time on routine tests when intervention isn’t needed, but can respond quickly if readings fall outside a safe range.

Indeed, in doctors’ surgeries, experts say the information collected by personal devices is already starting to provide useful diagnostic data – even if, at present, the system is as simple as the patient handing their phone over to their GP to show historic readings.

“Someone might be sitting in a surgery and telling the doctor they feel unwell, but before these apps the doctor had no idea of what the patient’s heart rate or temperature were before they came in,” said Lloyd Price, co-founder of medical appointment-booking service Zesty.

“A doctor might ask how a patient felt last week or three weeks ago, but this isn’t much help if the patient can’t remember precisely,” he added. “Now there’s a record; patients can hand over their smartphones to give GPs much better information on which to base their assessment.”

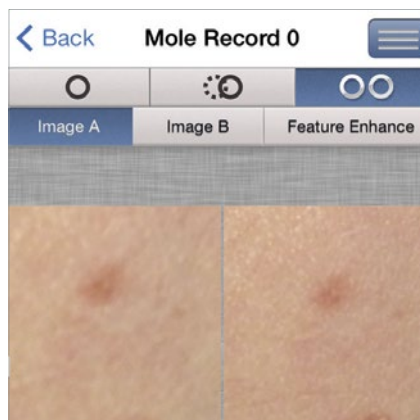
APPS IN ACTION

Trials are already taking place to explore how apps can improve treatments. One app asks schizophrenia sufferers to regularly complete a short digital questionnaire about their state of mind and medication. This provides vastly more diagnostic data than can be captured during home visits by carers, and if the results indicate a deterioration in mental health, it can be flagged up immediately.

“The app extends the snapshot you’d get from a paper questionnaire to a ‘conversation’ of short questions via smartphone,” explained Professor Iain Buchan. “The app must learn not only about mental-health measurement, but also engage the user without boring or annoying them... and give the user a greater sense of control over their symptoms.”

If a user’s symptoms appear to be deteriorating, the app alerts them before anyone else, so that they feel involved and can take action, such as resuming medication. It’s hoped that self-monitoring could be more effective than routine check-ups.

“The surveillance system in the health service is a six-weekly visit from a psychiatric nurse. A lot of people relapse when the signs



▲ Mole Monitor – a diagnostic app that patients can use at home

are there, but hidden,” said Buchan. “Now we’re picking up those signs from the app responses, and that’s important, because you’re putting individuals in control of their own treatment. If a person with schizophrenia goes off medication and relapses, it can result in years of misery – which could perhaps have been prevented.”

QUALITY CONTROL

While personal health technology has obvious potential, consumer gadgets aren’t required to pass the same rigorous tests as the medical equipment used in hospitals – and this inevitably raises questions about their accuracy. Manufacturers of wearable devices tend to describe their wares as “fitness” devices, and shy away from terms such as “health” or “medical” in product descriptions. While there are many good apps, there’s a risk of patients placing faith in those that aren’t.

“We’ve seen apps that are using smartphone cameras to detect skin cancer, and there’s no accreditation needed, no medical tests needed, nor authorisation,” said Simon Etchells, head of business development at Acticheck,

which is developing a smartband monitoring system, designed to contact family or friends if a wearer's readings indicate they might be ill or incapacitated. "And what they're finding is that they can lead to false negatives."

"If the user has a lesion, and they're using an app that says 'no, you don't have cancer', that's not good," Etchells added. "We're very conscious to say we're an alerting system rather than a medical-device provider. If something is going wrong, then we call in a human to respond in the appropriate way. We're not a medical app."

DATA-CENTRIC MEDICINE

While apps and shiny gadgets capture the headlines, the real driver behind the health revolution is the data - both for individuals and at the level of whole populations.

"The fastest-growing area for this is remote monitoring," said Price. "It's where people wear a bracelet that collects data and sends it back to a server, where it's monitored by a hospital or a patient's clinician. So, for example, if you have someone who's a diabetic, what's happening to their bloods is regularly fed back, so that doctors can change treatment levels if necessary."

While helping individual patients, the data can also be used - once suitably



anonymised - for large-scale research. Collected together, the data from a large number of diabetes sufferers provide an overall picture of their habits and health.

"Doctors like it, because it's increasing how much data they're seeing," said Price. "Instead of information about 20 people from their surgery, it's 200,000 all sharing - and the sharing is key to the medical community. It

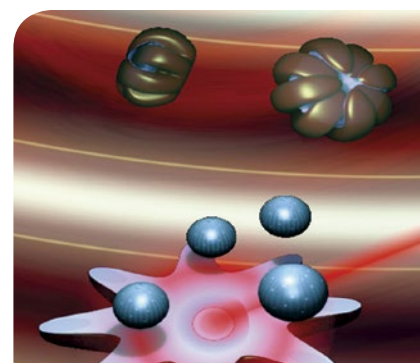
isn't in dribs and drabs; they're seeing what 200,000 diabetics are doing; there's a pool of information."

There's some way to go when it comes to data sharing. Currently, much of the information that's gathered is locked up in standalone smartphone apps, because the different software platforms don't yet talk to each other, and developers are understandably wary of sharing such valuable and sensitive data.

"If you think about the Apple Watch, and such products, it's easy to say 'this can be integrated with my health records, and the data can go straight to my GP and they can monitor my health,'" said Silvia Piai, senior research manager for IDC Health Insights. "But there's a real question over the interoperability of the data, and how to integrate it with the systems used by the doctors. That's the difficult part. The huge benefit will come only if we can integrate better between the medical and the consumer side."

The issue isn't a showstopper, though. Tech companies, including Apple and Google, are positioning themselves to provide a platform for health professionals to use and create healthcare apps, and to enable them to talk with each other. For example, a heart-monitoring app could exchange data with a blood-pressure app to build a more detailed picture of any significant changes over time. And with a common platform, the information could be passed directly to a doctor if the data indicated a need for medical attention.

Already, Apple is talking to hospitals in the US about how its offerings can be integrated into current medical systems, and Google looks likely to follow suit. How far the tech industry succeeds in establishing a common platform will determine more than anything else just how beneficial these tools can be, for both individual patients and human health in general. ●



BIONIC MEDICINE

Today's emerging health technologies focus largely on healthy living outside of the doctors' surgery. But work is also underway in developing new in-hospital technologies that can transform treatments for illnesses and disabilities.

For example, the University of Leeds is working on a system to provide amputees with sensations from prosthetic limbs, by plugging sensors directly into the recipient's nervous system. "We can embed sensors in the fingers of the prosthetic hand, and those signals will be delivered wirelessly to the original nerve in your arm," said Dr Rory O'Connor, senior lecturer in rehabilitation medicine at Leeds.

"So when you're picking up an object, you won't know it's not your original hand touching the object. We're embedding sensors that are 40 microns in width, which can be put into the peripheral nerve and integrated into the body's own sensory system. The electrodes will go into the bundle of nerves for touch, temperature, vibration and sensation."

"There are lots of people living with damaged nerves from diabetes, and this would allow us to bridge the gap. It could be used anywhere in the body, from peripheral nerves to the spinal cord, if it's been severed." The researchers hope to develop a working prototype within three years.

Meanwhile, researchers at the Swiss Federal Institute of Technology in Zurich are working on nano-scale robots that will carry a medical payload through the bloodstream to deliver treatment directly to the affected area. The researchers have started tests for treating age-related eye disorders, but the concept could be used for more complicated treatments as it's developed over the next decade.

"If we can make tiny things that can move in intelligent ways, a good application would be small devices that carry drugs and target particular locations in the body," said project leader Professor Bradley Nelson.

"For example, we can deliver drugs to very specific locations in the retina. Over the next decade, I think we'll see devices that can do this - perhaps delivering stem cells to various locations to help treat things."



< Some would say that health and fitness apps are the most useful aspects of smartwatches today

SLEEP BETTER



Studies show that 70% of us sleep for fewer than seven hours a night; a third of us get only five hours in the Land of Nod. Sleep deprivation is associated with issues ranging from impaired cognition and weakened memory to reduced immunity, so getting a good night's rest really is as important to your wellbeing as regular exercise and a healthy diet.

Enter the growing range of apps and gadgets aimed at helping you understand your sleep patterns and to get not only more shuteye, but a better quality of rest.

SMARTPHONE APPS

The simplest way to track your sleep doesn't require dedicated hardware. Leave your smartphone lying on the bed overnight and its built-in accelerometers can monitor your nocturnal movements. An app such as Sleep Cycle (\$2; Android & iOS) can then use this information to determine when you're in light or deep sleep.

This allows the app to calculate the best moment within a specified half-hour window to wake you with a mellow alarm, bringing you gently out of light sleep instead of crashing into the deepest part of your sleep cycle. It will also give you a report on the quality of your sleep, which you can record against notes on your pre-sleep activity (a stressful day, caffeine before bed or an evening workout), so you can keep tabs on what works for you. SleepBot (free; Android, BlackBerry, iOS & Windows Phone) does a similar job, with slightly cruder graphs.

WEARABLE DEVICES

If you're wearing a wristband or armband as part of your fitness regime, it may already have built-in sleep-tracking functionality. The lightweight Jawbone Up Move (\$80) uses a triaxial accelerometer to sense periods of light and sound sleep; you'll need to remember to set the device to "sleep" mode to begin tracking (and switch back in the morning so that your data is synced

to a phone or tablet).

After a few days' use, the app's Smart Coach begins to offer tips on how to achieve your sleep goals and rewards you for a good night's kip.

The more upmarket Basis Peak (\$450) also tracks heart rate and calorie burn, and automatically senses when you're asleep, so there's no need to change mode as you doze off. You can set daily and weekly sleep targets, so there are plenty of short-term rewards en route to your long-term health goals. The battery only lasts for a few days, however, so if you're wearing it overnight you'll need to remember to top it up during the day - a limitation shared by most current-generation wearables.

IN-ROOM DEVICES

If you're serious about shuteye, it's possible to spend some serious money on sleep technology. The Withings Aura Smart Sleep System (\$440) features an under-mattress sensor that monitors your motion, heart rate and breathing, while a bedside monitor tracks noise, light and room temperature, providing a comprehensive overview of your sleep environment. A soft red light and soothing music lull you to sleep; and in the morning, the Aura wakes you with blue light and soft sounds - more pleasant than a noisy alarm clock or radio host.

The Luna smart mattress cover (lunasleep.com), although not yet on sale, promises to go one better, managing

the temperature of your surroundings as well as tracking sleep stages with built-in sensors. You can even set the two sides of your bed to different temperatures - ensuring cool, crisp sheets for you and a toasty duvet for your cat. The manufacturer plans to start shipping the product worldwide next year.

What's next in sleep technology? All of these devices use motion detection - sometimes partnered with heart-rate tracking - to track your sleep patterns, but an electroencephalogram (EEG) to read your brainwaves directly

will provide a more accurate picture. Believe it or not, that technology may not be far off: a company called NeuroVigil has already developed a lightweight EEG reader for home sleep tracking, and while it's currently focused on medical research, it's the logical next step for consumer sleep tracking.

EVERYDAY RELAXATION

Tense muscles, stress and anxiety can all scupper your sleep; before you turn in, a calming yoga session may be exactly what's needed to help you relax. There's no shortage of apps that can help you explore yoga postures (or asanas) using text, image and video. It's best to use these to complement a regular class with a qualified instructor, however, as getting it wrong could lead to injury.

When it comes to hardware, two companies are currently developing smart mats that can help you achieve the correct alignment and balance. Quirky (quirky.com) has developed the Beacon, a pressure-sensing mat that uses LEDs to tell you when you're correctly in position.

The company is now looking for business partners to take the product to launch.

MY WEEK OF SLEEP

The Sleep Cycle app was a revelation. More than once it showed that I'd been unknowingly awake in the night - explaining that sluggish feeling

the next morning. The Jawbone Up Move, meanwhile, revealed that my bedtimes were much less consistent than I had thought.

But these devices can't help you get to sleep, or silence a noisy neighbour, and it's up to you to draw connections between the pretty graphs and your sleep experience. Data from the low-cost Up Move helped me adopt a more regular routine, after which my sleep quality definitely improved. To go further, a holistic approach is needed, to transform sleep tracking into meaningful sleep coaching. **LISE SMITH**



> Tracking could help you improve the quality of your sleep

LOSE WEIGHT

Losing weight is a challenge for most of us, and frankly there's a limit to how far technology can help. While a wearable gadget can automatically track your exercise, it can't directly determine how many calories you're consuming.

However, technology can help you keep track of your own intake. The free MyFitnessPal app (myfitnesspal.com) - available for Android, BlackBerry, iOS and Windows Phone - provides an easy interface for recording meals and snacks, drawing on a vast database of more than five million food types. That means no more squinting at the "nutritional information" on the back of a packet: you can simply type in "Monster Munch", tap the relevant flavour and pack size, and get on with your life.

As the name implies, MyFitnessPal isn't just about calorie-counting; you can also record exercise, to get the credit for calories burnt. The app integrates with a huge range of fitness-tracking apps including Runtastic, Garmin Connect and Fitbit Tracker.

The app keeps a running total of your daily calorie intake, so you can see at a glance how you're doing as the day draws on, and make an informed decision about dessert at dinner time.

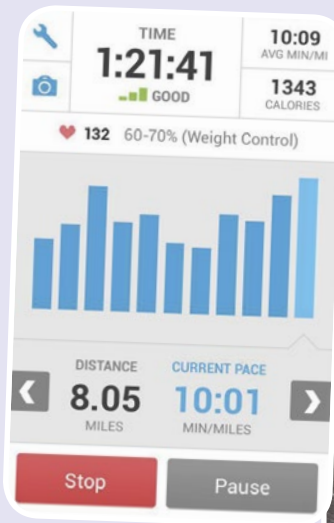
You can also set a weight-loss target and choose a daily calorie allowance that will get you to a certain target weight by a specified future date.

MY WEEK OF WEIGHT LOSS

My first impressions of MyFitnessPal were very encouraging. After I'd entered a few vital statistics, a weight-loss target and a timescale, it plotted out a calorie plan, promising that if I followed it I'd lose 4kg in a month. It seemed excitingly achievable.

The trouble is that a month is a long time to remain vigilant about entering everything you eat and drink into an app. Within days I started to become careless, with depressingly predictable results: my 4kg target began to seem like a mere fantasy. The developers proudly claim that the app's played a part in millions of weight-loss stories, and I can believe it - but the commitment and willpower still have to come from you. If tech is to make weight-loss genuinely easy, a more drastic approach might be required. Fat-digesting nanobots, anyone?

DARIEN GRAHAM-SMITH



▲ Track your calorie intake and exercise through MyFitnessPal



WATCHING YOUR WEIGHT

MyFitnessPal relies on you to be honest about your progress; if you want a gadget to track and analyse your weight-loss results, consider a set of smart scales for your bathroom, such as the Withings Smart Body Analyzer. It can record your regular weigh-ins and transmit them to your Android or iOS device over Wi-Fi, to automatically build up a motivational weight-loss graph.

It's not necessarily just about weight, either. The Smart Body Analyzer can take your pulse (through the soles of your feet), and factor in your height to calculate your body-mass index. It can even zap you with a very weak electrical current and measure the impedance, to assess how much of your weight represents healthy muscle tissue, and how much is less desirable fat.

For those who enjoy a home-cooked meal, smart scale technology can also help in the kitchen. The SITU food scale hooks up to an app on your iOS device, through which you can tell it precisely what sort of food you're weighing. With this information, the scale can tell you the total calorific and nutritional value of each ingredient. The Orange Chef Countertop system works similarly; its app goes one step further to recommend recipes and complementary exercises.

SLOW DOWN, YOU MOVE TOO FAST

One appealingly lateral approach to weight loss is the HAPIfork, a \$99 Bluetooth-enabled fork that focuses not on what you eat, but

how quickly you eat it. Since excess calorie intake tends to be associated with gobbling things down quickly, the HAPIfork vibrates a warning if it detects you're shovelling food too urgently into your mouth. It also records how many forkfuls you eat at each sitting, and how long you spend over each meal, so you can track your eating habits over time and settle into a healthier, more relaxed eating routine.

BALLOONS AND PILLS

The future of weight loss takes a variety of forms. One approach that's being developed involves implanting soluble balloons into the stomach, to create feelings of fullness for a limited period, after which the balloon dissolves without needing to be surgically removed. Earlier this year in the US, the FDA approved an electrical device called Maestro that works similarly to a pacemaker - but instead of regulating the heartbeat, it stimulates the nerves that create sensations of fullness.

Frankly, though, most of us don't want to have a device inside our bodies. Our hopes might be pinned instead on chemical solutions: research laboratories have for decades been working on pills that suppress appetite, promote feelings of fullness, prevent the absorption of fat or stimulate the body to burn more calories.

Concerns over possible side effects have kept such medicines out of the mainstream, but when a safe formulation is found, the world of weight loss could be transformed forever.

CHEAT DEATH

While fitness gadgets can help you live longer, some see that as a mere step on the road to a far more ambitious goal. Scientists are talking seriously about pushing back the final frontier, enabling humans to live vastly longer lives – possibly even forever.

The idea might sound outlandish, but the replacement of old cells with new ones is a regular biological process. There's no reason why, with technological know-how, we shouldn't be able to prolong it indefinitely.

There's evidence to suggest that ageing isn't an inevitable part of being alive. Back in 1993, in a groundbreaking research paper, Professor Cynthia Kenyon showed that disabling a specific gene in worms led to their living twice as long as normal. At the University of Southern California, gerontologist Dr Valter Longo has shown how disabling genes can similarly increase the lifespan of mice. Now, research is underway into whether such techniques could defeat ageing entirely – and whether they can be applied to humans.

THE INITIATIVES

Hedge-fund manager Joon Yun is promoting such research in a very direct way. He's put up a million dollars under the banner of the "Palo Alto Longevity Prize" – a prize for finding ways to combat ageing and restore vitality in mammals. That second part is important, of course: living for hundreds of years would be a dismal experience if it came with the frailty of extreme old age. Therefore, half of the prize money will go to a team that manages to restore the vitality of an ageing animal to match that of a younger specimen, while the rest is for extending its lifespan by at least 50%. The vitality contest closes next June; the longevity prize closes in 2018, so we'll have to wait to see if either can be won.

A venture with a more hands-on brief is the California Life Company – Calico for short. Founded in 2013, its work so far has included collaborations with multiple medical institutions exploring age-related diseases and cognitive decline. Its research staff comprises experts from the fields of medicine, drug development, molecular biology and genetics – including the above-mentioned Cynthia Kenyon, who holds the title of vice president of ageing research. There are plenty of other institutes working on similar projects, but Calico looks like an unusually good bet since it's exceptionally well funded – being, as it is, founded and backed by Google.



< Those suffering incurable disease could one day be helped by cryonics

YOUNG AGAIN

One of the most prominent individuals in the fight against ageing is Dr Aubrey de Grey, a scientist and author. Previously a software engineer at Sinclair Research, in 1999 de Grey published *The Mitochondrial Free Radical Theory of Ageing*. In it, he linked ageing with cells becoming damaged, failing to function as they should or accumulating "junk" molecules – and he believes that by combating these processes it ought to be possible to prolong life almost indefinitely.

Dr de Grey's hopes for anti-ageing research were set out in a 2005 TED Talk:

"If you're only 50, then there's a chance that you might be able to... start becoming biologically younger in a meaningful sense, in terms of your youthfulness, both physical and mental, and in terms of your risk of death from age-related causes. And of course, if you're a bit younger than that, then you're never really even going to get near to being fragile enough to die of age-related causes."

In 2009, de Grey co-founded the SENS (Strategies for Engineered Negligible Senescence) Foundation in the US, with the aim of promoting and bringing to reality "the repair of living cells and extracellular material in situ".

CRYONICS

Technology that can restore our youth and cheat death won't come soon enough for everyone. Enter cryonics: the field of science

that deals with freezing just-dead or dying humans, with a view to resuscitating and restoring them to health in the future.

By contrast with the cutting-edge work that's being done in genomic anti-ageing research, cryonics certainly isn't a new idea. It was popularised in 1962 in a book entitled *The Prospect of Immortality*, written by US academic Robert Ettinger. In 1967, psychology lecturer James Bedford became the first person to be frozen immediately after death with a view to future revival.

To date, no-one has yet attempted to revive a frozen person from a cryonic state; it's feared that the organs of older subjects may have been permanently damaged by the water in their bodies forming crystals as it freezes. But, amazing as it sounds, the idea could work.

In 2005, researchers at the University of Pittsburgh managed to place dogs safely into suspended animation by draining their blood and replacing it with an ice-cold saline solution. The dogs spent three hours in a state of clinical death with no heart or brain activity; when the blood was returned, and the dogs' hearts were stimulated by electric shock, they returned to life, in most cases with no visible ill effects.

In the future, the technique could be used for the victims of critical injuries, to buy time for treatment to be arranged. Or it could be used to freeze people with currently incurable diseases, until such time as a cure can be found.

IF YOU'RE
ONLY 50, THEN
THERE'S A CHANCE
THAT YOU MIGHT
BE ABLE TO START
BECOMING
YOUNGER

GET FIT

Fitness goals are easily quantifiable, whether you're shooting for 10,000 steps a day or 1,000 calories burnt. So if you're trying to get fit by running, swimming, riding a bike or playing sport, there's probably already a wearable device on the market to help.

RUNNING

Running pace is one of the easier things for modern gadgets to measure: ratty pedometers have been doing the same job (albeit less accurately) for years. You don't even need a dedicated device: a smartphone with MapMyRun (free; Android, BlackBerry & iOS) installed will chart where you go on your runs, how long it takes, your pace, and how many calories you burned doing it. Even apps that ostensibly have nothing to do with running are getting in on the act: an in-the-works update to Spotify's iPhone and Android apps will introduce a Running mode, with curated playlists and the ability to measure your speed and play appropriately paced motivational music.

When it comes to dedicated hardware, there are plenty of options, although they aren't created equal. As we've noted before, the Microsoft Band's optical heart-rate monitor doesn't measure your pulse frequently or accurately enough to track a serious cardio session.

The Apple Watch generates more accurate results, and while it lacks the cross-platform appeal of the Microsoft Band, it also enjoys much broader app support: on the day of the Apple Watch's launch, RunKeeper was made available for the new platform, and with third-party native apps (apps that don't rely on an Apple Watch's host iPhone) due for release in autumn, the Watch is a strong contender with bags of potential.

What is the future of wearables for running? In a press release at the end of last year, Sony announced its SmartEyeglass Attach concept. Using a tiny OLED screen attached to a pair of sporty-looking glasses, the Attach gives you a real-time view of fitness data, gleaned either from onboard sensors or a Bluetooth-connected smartphone that can stay in your sport arm band or pocket.

CYCLING

Cycling technology is already big business, so the treasure trove of cycling gadgets comes as no surprise. Those looking simply to map their rides, and track speed and gradient information, can use the Strava (free; An-

droid & iOS) app, which uses a smartphone to record the relevant data. Competitive types can then compare their stats with others' on Strava's website - turning a gentle Sunday morning ride around popular locations such as Richmond Park into gruelling tests of stamina against the personal bests of superior athletes.

Garmin has created an interesting cross-genre device in the VIRB Elite. A 1080p camera with built-in Wi-Fi and GPS, plus Bluetooth and compatibility with Garmin's ANT+ heart-rate monitors, the Elite allows you to turn your rides into data-rich, audiovisual feasts. Or there's Recon's Jet - an Android-powered Google Glass-type affair with a tiny WQVGA display that, according to the company, is like looking at a 30in monitor from 7ft away. The display can keep cyclists up to date with things such as distance travelled and speed, while ANT+, Bluetooth and Wi-Fi all make appearances. It can pair with a phone to work as a hands-free kit, but because it's powered by a 1GHz ARM Cortex-A9 processor and has its own GPS unit, it doesn't need one to work. It comes preconfigured for popular exercise services such as Strava and MapMyFitness; cycling geeks will appreciate the ability to export raw data files into other applications.

Finally, there's a very real way technology could prove a life-saver. The ICEdot Crash Sensor is a small puck-style device that connects to a host smartphone (Android and iOS are supported) via Bluetooth. If the sensor's internal accelerometer detects a sufficiently violent blow, a countdown is triggered, at the end of which the host phone delivers an emergency text, including GPS co-ordinates, to a pre-entered number.

FOOTBALL

Although overall fitness plays a big part in football, there's also a host of football-specific smart devices and wearables aimed at helping Sunday-league players hit peak form. Adidas is leading the charge with miCoach, a fitness-tracking system that includes running, football, tennis and general fitness via a host of gadgets such as the Speed_Cell, a Bluetooth sensor that sits on your trainers and records up to eight hours of fitness activity. This can be synced to a smartphone (Android, iOS and Windows Phone are all supported) and stored online. The website can then be used to measure your performance against other athletes, including - a mite depressingly for anyone who reckons they're half-decent - data gleaned from Argentinian legend Lionel Messi during a 2012 friendly



against Germany.

Adidas also makes the miCoach Smart Run, a \$500 Apple Watch-alike that does a similar job to the Speed_Cell with the addition of a heart-rate monitor and an integrated 1.45in, 184 x 184 display.

Finally, for the truly data-driven, there's the miCoach Smart Ball, a regulation football whose difference isn't just its steep \$270 price. A triaxial accelerometer inside it records data such as speed, spin and precisely where the ball was hit, to help you improve strike technique. Data is fed back to an iPhone for later inspection.

SWIMMING

Combining technology with water is normally a recipe for disaster, but devices such as the Garmin Swim are turning the tide: this sports watch is waterproof to 50m and capable of detecting which stroke is being used, along with a length counter and the ability to measure your stroke and pace.

Then there's its incoming rival: Swimmo, an aquatic smartwatch, launched on Kickstarter earlier this year aiming to raise a modest \$80,000, but attracting more than \$360,000 in pre-orders. The first batch is set to be delivered to dedicated dippers in October 2015. Like the Garmin, it offers a length counter, with pace and distance tracking; unlike Garmin's offering, there's also a heart-rate monitor and a full-colour 1.29in screen. Its data is also compatible with apps including Strava, RunKeeper and, usefully for Apple users, HealthKit. Swimmo can be preloaded with workout goals, and an internal motor provides a vibration alerts.

GOLF

Golf has a reputation as an expensive sport, and golf-orientated GPS devices - handy for measuring the distance to the hole - have been around for some time. Lately, they've taken on a wearable dimension. TomTom's Golfer watch has a monochrome, 0.45in, 168 x 144 screen, and looks sufficiently like an Apple Watch to make us suspect a dedicated iOS app can't be far off.

SAMSUNG PORTABLE SSD T1

*Fast and reliable data access
in the palm of your hand.*

Portable data storage very much has a place in the modern tech world, yet typical flash drives lack the speed and storage capacity that we have been enjoying with internal Solid State Drives (SSDs). Samsung has an external drive solution that combines zippy performance, generous capacity and sleek design.

FAST READ/WRITE PERFORMANCE

The Samsung Portable SSD T1 external drive is a speedy storage solution out of the box. Its USB 3.0 compatibility means sequential read/write speeds of up to 450MB/s*, care of TurboWrite Technology and enhanced data transfer speeds with UASP.

The T1 external drive is designed specifically for Windows and Mac operating systems (Windows 7 or higher and Mac 10.7 or higher recommended), with a default exFAT file system for read/write functionality across platforms.

In lay terms it means superbly fast

access to files and an external-storage solution that responds like an internal SSD.

SAFE AND SECURE DATA

There's no point worrying about the safety of your data when using an external drive. The user-friendly software wizard on the Samsung Portable SSD T1 offers the option to enable password-protected access. With password protection disabled, the T1 can be seamlessly used with compatible non-PC devices that support USB. With password protection enabled, AES 256-bit hardware encryption kicks in to block unauthorised access.

Designed also to physically protect your files, the T1's lack of moving parts makes it extremely durable as it exhibits significant resistance to impact shock. This means the T1 is safe to use in a range of different environments, with a limited three-year warranty for additional peace of mind.

PORTABLE AND STYLISH

The T1 is lightweight and portable which means that it can be practically stored in a bag, slotted into a wallet, or quite literally slipped into a pocket, offering the portability of a flash drive with the capacity and speed usually reserved for internal SSD.

The slim, compact design is just part of the appeal. With laser patterning and a black chrome finish, the T1 is as much a chic accessory as it is a piece of portable hardware. It's fashionable enough to be trendy on the outside and fast enough to deliver the goods where it matters. All

you need to do is connect the matching jet-black USB cable to a compatible device, and you're able to instantly read, write and transfer your files.

USER-FRIENDLY OPTIONS

There's no such thing as a one-size-fits-all solution when it comes to external storage. Some are looking for a medium storage option for files and pictures, others for storing raw images, and others still working with large video files. The T1 comes in 250GB, 500GB and 1TB models to suit external-storage requirements across a range of capacities.

You may not be able to depend on the consistency of an internet connection when you're out and about to access gigabytes of cloud-stored data, but you can rely on the Samsung Portable SSD T1. It has the speed and storage capacity of an SSD drive, the dependability and durability of enterprise-grade hardware, as well as the design and visual appeal that positively encourages you to take it everywhere!

LATEST TECHNOLOGY

The T1 external drive takes advantage of some pretty clever tech to deliver its portable performance and reliability. Thanks to V-NAND technology, the T1 is able to achieve higher speeds, greater endurance and boosted power efficiency, while simultaneously offering a larger storage capacity. This is achieved by evolving the traditional 2D NAND storage principles and embracing a 3D vertically stacked internal structure.

*Performance benchmark products : T1(500GB)



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THE RISE AND RISE OF THE CHINESE SMARTPHONE

BANG PER BUCK VALUE FOR SMARTPHONES MAY HAVE IMPROVED, BUT CHANGES IN CHINA'S SMARTPHONE MARKET COULD SEE CHINESE SMARTPHONES ARRIVING LOCALLY, SPARKING INTENSE COMPETITION. BY **PAT PILCHER**

You'd be forgiven for thinking that HTC and Sony and other big brands make up what's left of the global smartphone market after Apple and Samsung's share has been accounted for - except you'd be wrong.

It's a good bet that you've probably never heard of many of the brands that follow the top two global smartphone players.

Ten of the top seventeen top global smartphone brands in the world are Chinese. They rarely rate a mention in the west, but are household names in China.

BIG BRANDS, BIG MARKET

Xiaomi (pronounced she-a-ow me), ranked third in terms of global smartphone shipments is probably an exception to this, as is Huawei.

Chinese brands have also gained ground in the Chinese market at the expense of western brands according to Mark Tanner, director of Shanghai based strategic consulting firm, China Skinny

"In 2011, three foreign brands, Nokia, Samsung and Apple accounted for almost 70% of the Smartphone shipments. In 2014, with the exception of Samsung, Chinese brands dominated"

THE CHINESE ADVANTAGE

So should western smartphone makers be worried? Many Chinese brands are selling unlocked high-end smartphones at significantly lower prices than their western counterparts.

It isn't just pricing either. The spec, build and design of these smartphones make them pretty compelling options, outstripping what's available locally. This is helped along by fierce competition in the Chinese market according to Tanner;

"Chinese brands will generally invest less on R&D than their foreign competitors, and with a massive pool of lower-cost (but

rising) engineers, a great infrastructure for developing gadgets and a fiercely competitive market that has forced them to operate on razor thin margins."

Huawei is the largest manufacturer of networking equipment and are currently building out nearly half of the world's 4G networks. A hint of their sheer scale comes from the fact they recently committed to investing US\$600 million in 5G research over the next four years.

Huawei may be lesser known than the likes of Apple and Samsung, but they're making moves to shrug off the budget brand image they've been saddled with in the west by launching new high-end devices such as the P8.

Chinese brand Xiaomi recorded impressive growth with 2014 shipments up by over 200% on the previous

year at 18 million units according to IT market researchers, IDC.

Xiaomi came out of nowhere in 2010. Marketing on Chinese social media has seen them become the handset of choice for young, trend conscious and increasingly affluent urban Chinese.

Xiaomi's marketing strategy is unconventional and attracts a lot of attention. One wacky example was a management team plankton contest which saw a photo go viral on Chinese social media network, Weibo. The photo was shared 3,000 times in just 24 hours.

SHOULD SMARTPHONE MAKERS BE WORRIED?

So how would western smartphone makers fare if Chinese smartphone makers were to move into their markets?



THE GLOBAL SMARTPHONE MARKET, 2014

	Q1 2014	Q2 2014	Q3 2014	Q4 2014
Total Shipments (Global)	288,326,414	302,088,372	332,563,022	377,646,902
Total Shipment (Global Top 20)	260,505,543	269,569,287	292,361,448	336,886,082

Source: IDC, 2015

Apple command fierce brand loyalty at the upper end of the smartphone market and are unlikely to be affected by Chinese brands. It'd be a different story in the Android market. Here western brands could face stiff competition from Chinese smartphones offering extremely sharp bang per buck value aimed at particularly price sensitive customers.

Many flagship Chinese smartphones are typically priced at what a mid-range device sells for locally (\$199 - \$399 without a contract). Most of these Chinese smartphones at this price point feature top end specs including large high res screens, four- or eight-core CPUs, 4G and high resolution cameras.

So why the huge price difference? A misconception is that cheap labour makes Chinese goods (including smartphones) more affordable. Labour however only plays a small part.

Loosely enforced intellectual property laws in China mean that Chinese manufacturers rarely have to factor intellectual property costs into manufacturing, marketing or sales costs. In other countries intellectual property requirements translates into royalty payments, all of which adds to the overall costs of a smartphone. Not being saddled with these gives Chinese smartphones a big price advantage.

CHANGES ARE AFOOT

So could we soon be seeing Chinese brands locally? Speculation is mounting that changes in the Chinese smartphone market could see Chinese smartphone makers eyeing up western markets to maintain

✓ Xiaomi's CEO and founder Lei Jun launches the latest Mi smartphones



their strong growth.

The latest data from IT market research firm IDC shows the Chinese market has shrunk for the first time in six years. Q1 Chinese smartphone Shipments dropped by 4% on the same period in 2014.

Even though the Chinese market has slowed, Apple's share grew thanks to the iPhone 6+ which is proving popular with Chinese buyers. Whether Apple can hold its position in the ultra-competitive, fast moving Chinese market remains to be seen. Either way, these changes could have implications for the local markets.

According to IDC analyst, Joseph Hsiao, Expansion into the west may be high on the agenda of many Chinese smartphone manufacturers, but bigger opportunities await elsewhere:

“In other countries Intellectual property requirements translate into costs”

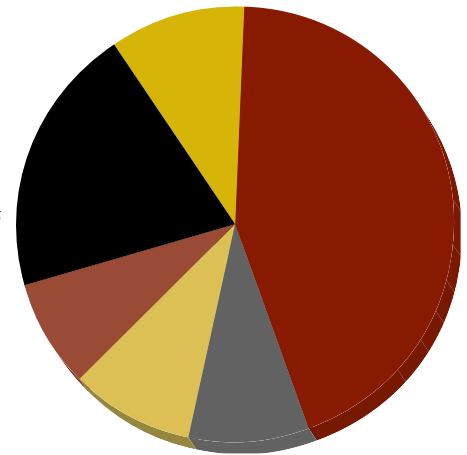
“Many Chinese smartphone manufacturers have a vision to expand abroad. Out of the 1.6 billion global shipments of smartphones forecasted for 2015, 1.0 billion units are expected to be shipped in the Asia-Pacific (excluding Japan) region, which may prove a more lucrative market for Chinese vendors.”

Hsiao is also confident that challenges await Chinese smartphone makers who make the move.

“Hurdles that Chinese vendors must overcome, include (but are not limited to):

- Legal challenges: patent infringement is a key restraint for foreign vendors in countries with strong intellectual property enforcement. This could prove expensive and lock a brand out of a market altogether.
- The “Made-in-China” connotation: although the association of low-quality “made-in-China” mark is diminishing, a new association with cyberespionage has now arisen.
- Lack of brand awareness: The overall awareness of Chinese smartphone brands is in much of the Western world. According to Interbrand's 2014 Best 100 global brands ranking, only one Chinese brand was included, Huawei, at #94.”

Chinese players Huawei and ZTE are targeting Xiaomi fans with their Honor



CHINA SMARTPHONE SHIPMENTS Q1 2014

Others - 44%
Lenovo - 10%
Samsung - 20%
Huawei - 8%
Xiaomi - 9%
Apple - 9%

and nubia brands, whilst Lenovo is has yet to fully take advantage of its Motorola acquisition. As competition in the Chinese market continues to intensify, it is also probable that Huawei, Lenovo, and Xiaomi will push into high-end markets, seeking greater profit margins with upmarket smartphone hardware.

Increased competition in a slowing market could also to see telco subsidies dip. This could in turn drive more emphasis on online sales channels including big Chinese e-commerce services such as Alibaba.com over bricks and mortar retailers and telcos.

According to Hsiao, a slowing Chinese market could also result in a stronger focus on overseas markets.

“IDC is of the opinion that the challenges facing Chinese vendors means expansion into the Western market will be gradual but noticeable. More players will result in a change in the competitive landscape especially in Western countries where smartphone saturation is relatively high. Western smartphone makers will need to focus on unique value proposition other than price in order to survive/thrive under this new dynamic.”

While this is likely to initially see a greater Chinese presence in India and Southeast Asia, the good news for us consumers (and bad news western smartphone makers) is that the inevitable entry of Chinese smartphone makers into western markets could see high-end (but more affordable) Chinese smartphone hardware forcing western brands to offer much more smartphone value for far less money. Bring it on I say.

IN THE LABS

Now with all-new benchmarks

NEW BENCHMARKS

BEN MANSILL BRINGS BIG NEWS FROM THE LABS

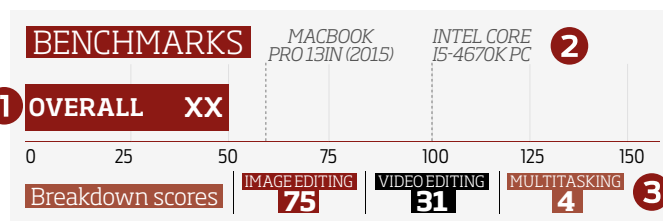
As of this month, we're retiring our old benchmarks and switching to a new set, ready to take on the multi-format, multi-platform future of computing.

The new tests use open-source software to run a set of three benchmarks: a typical image-editing test, an intensive 4K video-editing test, and a tough multitasking test.

The time taken to complete each test is compared with a reference machine, as usual, and the scores normalised. Our yardstick is a desktop PC with an Intel Core i5-4670K CPU, 8GB of DDR3 RAM, and an AMD Radeon R7 260X graphics card; it scores 100 overall.

The graph you see at the bottom of each PC and laptop review will show an overall score that's directly comparable to the reference PC. A Core i5 laptop such as the Apple MacBook Pro 13in (2015) scores 56 on this scale; the Core M Asus Transformer Book T300 Chi scores 25. Below each graph you'll also find details of how the system scored in the image-editing, video-editing and multitasking tests.

We're also changing the way we test laptop battery life, to bring it in line with the way we test Android and iOS tablets – and, to a lesser extent, smartphones. We'll be setting the screen brightness to a brighter 120cd/m2 and playing a 720p video on loop.



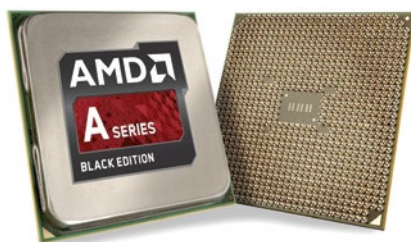
- 1 The overall score provides an idea of how fast a system is compared to others across a range of tasks. It's not an indicator of gaming performance, however
- 2 The overall score is compared with one or more reference machines
- 3 These scores show how the system fared in each component of the benchmark

Results won't be directly comparable to past reviews, but we will initially be running our old tests in parallel on select reviews to provide a frame of reference.

We hope our efforts to update our Labs methodology, and how we have presented this information, provides you with genuinely helpful tools to help you make balanced and informed purchasing decisions. As always, we welcome all feedback so do please let us know what you think at inbox@pcandtechauthority.com.au



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WHAT OUR A-LIST MEANS

Our A-List award is reserved for the best products in each category we review. With a winner and an alternative pick in each, that's 92 products you know are first class.

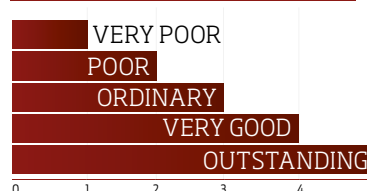


WHAT OUR AWARDS MEAN

PC & Tech Authority's comprehensive Real World testing sorts out the best products from the pack. Any product recommended by PC & Tech Authority is well above average for features, value for money and performance.



WHAT OUR RATINGS MEAN



HOW WE TEST

Our benchmarking tests are the best in the business. Read on to find how they work...

2D TESTS

Desktop PCs and laptops are tested using our own custom bench testing suite, which has been carefully designed to test all aspects of a system and rate them in a way that's useful to you.

Our benchmarking cover three main tests: a typical video editing test, a demanding 4K video editing test and a multitasking test that stresses all aspects of the system.

We look at the time it takes for each test to run, which is then compared to our reference PC to produce a normalised result. This score is shown on a graph, and to help you understand just where the PC we're reviewing sits in the grand scheme of things, we will often include other system's scores.

The median score of 100 is based on our reference system:

PC & TA REFERENCE PC. SCORE: 100

Intel Core i5-4670K CPU; 8GB of DDR3 RAM;
AMD Radeon R7 260X graphics card

On occasion we will run publically available bench testing software, predominantly PCMark 8 from Futuremark. This is run in the Home setting, in Accelerated mode. You can get PCMark 8 as well as 3DMark (below) from www.futuremark.com

3D TESTS

For video cards, as well as Integrated Graphics Processing Units, we use:

- 3DMark Firestrike
- Shadow of Mordor
- GRID Autosport

3DMark is designed specifically to test video cards, and you can download and run the same tool as us to help you gauge where your own GPU ranks compared to what we are reviewing.

The two games were selected because they are relatively well balanced in performance between AMD and Nvidia, favouring neither. Both feature a wide range of DirectX 11 shaders. GRID Autosport is fairly easy on GPUs, while Shadow of Mordor is quite demanding, so each provides a helpful gauge for you showing what to expect from a GPU in your favourite games. We will update these to cover DX12 once that API gains traction.

Tests are run using three resolution ranges, depending on where the GPU sits in the market:

Entry level: 1920 x 1080

Mid-range: 1920 x 1080 – 2560 x 1440

High-end: 2560 x 4K

BATTERY TESTS

Screen brightness is set to 120cd/m2, playing a 720p video on loop until the device runs out of power.

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Windows 10

FOLLOWING NINE MONTHS OF PUBLIC TESTING, WINDOWS 10 IS
READY FOR PRIME TIME. HAS MICROSOFT'S EXPERIMENT PAID OFF?

If ever an operating system has grown up in public, it's Windows 10. Since the first preview release appeared last October, its every tweak and transformation has been pored over by hordes of volunteer testers – almost five million of them, according to Microsoft's own stats on its Windows Insider Programme, feeding back usage reports and feature requests.

But on 29 July, Windows 10 makes its real debut. On that date, retailers will be selling PCs with Windows 10 preinstalled, and users of Windows 7 and 8 who have claimed their upgrades – more about this later – will be able to move up to the final release of the software.

Except that in the case of Windows 10, there's no such thing as a final release. The new version of Windows brings a new philosophy, which Microsoft calls "Windows as a service". Just as the Insider builds have progressively introduced

new features and interface elements, the public release of Windows 10 will continue to develop over time. There won't ever be a Windows 11 – major features that would previously have been saved up for a major release will now trickle out through Windows Update as they become ready.

This makes Windows 10 very much a moving target – a platform that might work in one way when you install it, but turn into something quite different in a year's time. For businesses, Microsoft is providing options to keep things stable (see Windows 10 for business, p39), but for consumers running the Home edition of Windows 10, Microsoft has taken the bold decision to disallow the skipping or deferring of updates. Like it or not, upgrading means taking an open-ended leap of faith.

So it's time to take a proper look at what's coming on 29 July, and give a verdict on the upgrade that will be

most people's first taste of Windows 10. Although the final code hasn't yet been signed off, with the launch in sight, the latest Insider build reflects the user experience day-one upgraders will see. "There might be a few icon tweaks, but now it's all about polishing," a Microsoft manager revealed to us.

WHY WINDOWS 10?

To be clear, the product that's being released on 29 July is a new operating system for your PC. Like previous versions of Windows, it's offered in both 32-bit and 64-bit variants, and in Home and Pro editions, alongside packages for education, enterprise and industry.

But Windows 10 is about more than a single piece of software. It represents the transformation of Microsoft's business, from a PC software company with a smartphone division into a grand unified platform, spanning from mobile devices to



▲ The Start menu returns, now with added Live Tiles

more sense on tablets, but here Microsoft was pushing Windows RT, and consumers were reluctant to buy in. They were wise to stay away: the platform has proved an evolutionary dead end, incapable of being upgraded to Windows 10.

Windows Phone, meanwhile, despite sharing design cues with Metro, was a different platform with a separate app framework. No wonder the Windows Store was initially a bomb, setting back Microsoft's dreams of emulating Apple's success in the emerging tablet-friendly app world.

Universal apps make the idea work at last. In Windows 10, it's possible to open a Universal app in a window on your desktop PC, then grab an Atom-powered Windows 10 tablet and carry on working with the selfsame app – in full-screen mode with touch controls. It will even be possible to run the same software on your Lumia phone once the Windows 10 Mobile update arrives – although that won't be until later this year, or perhaps even as late as early 2016.

And we're not just talking about games here. Microsoft has already unveiled Universal ports of the Office apps, and it's making a strong case for businesses to adopt the platform for internal projects.

How this plays out in the real world depends on third-party support, of course, which has so far been the Achilles heel of the Windows Store. But the proposition will be far more attractive to developers than it was when the Store launched three years ago. Thanks to Microsoft's generous upgrade terms, Windows 10 will be a huge market, with the company aiming for one billion installations by 2017. In short, this time, Microsoft has finally got the ingredients right.

WHAT'S NEW IN WINDOWS 10

Windows 10's "new" features are already familiar thanks to the multitude of preview builds. The headline, of

course, is the new Start menu. Not just a reinstatement of the old Windows 7 orb, this now offers Live Tiles with at-a-glance updates from Modern apps such as News, Mail and Calendar. By default it's a rather generous size, taking up at least a quarter of a Full HD screen, but you can resize it both horizontally and vertically, and if your tiles don't all fit, you can scroll to view them. On touch hardware, the Start menu opens in a full-screen view reminiscent of the old Windows 8 Start screen.

Start typing to search for an application or item and you'll meet the second major innovation in Windows 10. Cortana, the smart personal assistant introduced in Windows Phone, is now the default search agent for Windows 10, and can be invoked from the Windows key or with a three-fingered tap on your touchpad. The system finds programs and documents as before, but can also respond to other types of request: type in a calculation or a phrase such as "weather Sheffield" and results will pop up directly from your taskbar. It's a clever way of dissuading people from going to Google for simple errands, but not yet smart enough: after a few requests such as "show me bus times" yielded only dumb Bing searches, I found myself falling back on the browser.

Interestingly, Cortana keeps the speech-recognition capabilities of its original smartphone incarnation. If you choose to enable your device's microphone, you can simply declare "Hey Cortana", followed by your request. As well as carrying out searches, you can perform simple actions such as setting a reminder, checking your calendar or opening applications. It's certainly a plus for tablets that lack a physical keyboard.

The third big feature in Windows 10

✓ In tablet mode, the full-screen Start interface echoes Windows 8

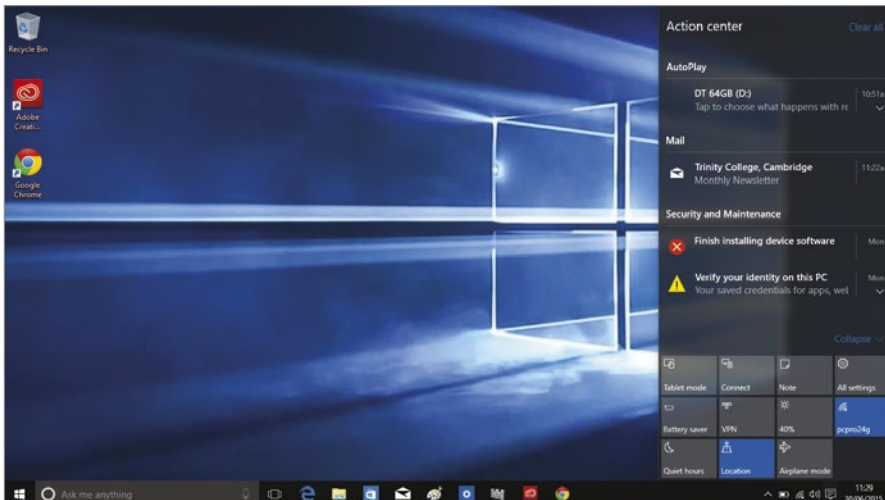
"Thanks to the upgrade terms, Windows 10 will be a huge market, with the company aiming for one billion installations by 2017"

is Microsoft's all-new web browser, codenamed Project Spartan and now called Edge. After 20 years of service, Internet Explorer has been deprecated in favour of something much simpler and slicker. Some might say Edge is too simple, since there's currently no support for plugins (a planned update later in the year should add this). Otherwise, it's responsive and easy to use, and because it's a Universal app there'll be no culture shock if you move between devices.

Edge even introduces a few interesting items, including an annotation feature that lets you scribble with a stylus onto a web page, or type into sticky notes, and save or share your markup for future reference – and across Windows 10 devices. There's Cortana integration too. Visit a restaurant's website and you'll see a Cortana prompt in the address bar: "I've got directions, hours and more." Click and the details appear in a pop-up pane at the side of the window.

Those major updates sit alongside a range of smaller tweaks. One simple but very likeable new feature is Snap Assist. It's an upgrade to the old Aero Snap feature in Windows 7, which let you dock windows to the sides of the screen by dragging or pressing the Windows key plus the left or right cursor. In Windows 10, when you snap a window into half-screen view, you're presented with thumbnails of other open windows: a click expands one





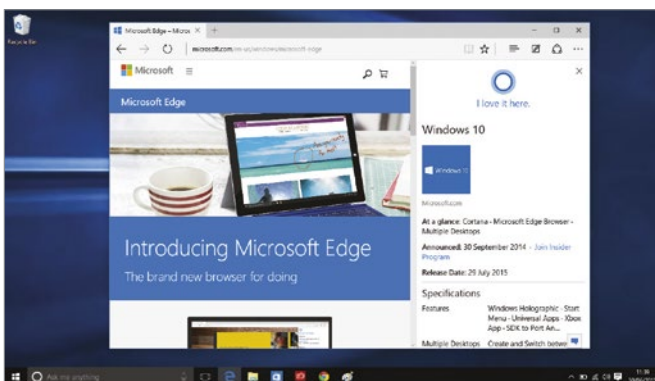
“Microsoft no longer wants to be held back by the inertia of huge numbers of customers using old versions of Windows”

If you're wondering whether the new OS will run satisfactorily on your PC or laptop, the good news is that Windows 10 has the same official hardware requirements as Windows 7 and 8, so performance shouldn't be an issue. As for stability, PC & Tech Authority staff have certainly seen blue screens and quirky drivers during the preview period – but after nine months of public testing and telemetry, Windows 10 is the most scrutinised edition of Windows ever, with every crash relayed back to Microsoft and analysed. If you're happily running Windows 7 or 8, there's no reason to expect trouble from the final release of Windows 10.

What about the user experience? If you're coming from Windows 8 on a laptop or desktop, you have everything to gain. While the latest 8.1 update resolved the worst quirks, the lack of a desktop-friendly Start menu remained a frustration, as did the very limited support for running apps in any mode apart from in full-screen mode.

The same is true for compact touchscreen devices. Alongside the new features detailed elsewhere, it brings a choice of operation modes – Desktop and Tablet modes – which you can switch between by dabbing a button in the notifications centre, or by docking or undocking a convertible device. You get a full-screen Start menu and apps when you want them, while the conventional desktop remains always at hand.

There's yet more for tablet users.



- ▲ The Action Center combines notifications and quick-access settings
- ◀ Cortana information opens in a side pane within the Edge browser

to fill the other half of the screen.

Nobody at PC & Tech Authority is so keen on the interface revamp that turns all title bars either white or grey – it creates a dull appearance that makes it harder to see at a glance which window is active.

WORTH THE UPGRADE?

In previous years, most of us only moved to new editions of Windows when we bought a new PC. With Windows 10, Microsoft aims to change that. If you're currently running a non-enterprise edition of Windows 7 or 8, you may already have seen a pop-up notification on your desktop inviting you to “reserve” your upgrade to Windows 10.

For once, there's no catch. As Microsoft moves to “Windows as a service”, it no longer wants to be held back by the inertia of huge numbers of customers using old versions of Windows. So for the first year of Windows 10's availability, Windows 7 and 8 users are entitled to a free in-place upgrade.

It's worth noting that the upgrade requires you to be using a fully up-to-date release of Windows 7 SP1 or Windows 8.1, so if you're not getting the pop-up, try running Windows Update. Those using compact tablets may also find they don't have enough storage for an in-place

upgrade: Microsoft says it's working on a solution, which will probably involve a USB flash drive.

The upgrade process is almost entirely automatic, and keeps your existing applications, so it's an easy offer to accept. If you're running a professional edition of Windows 7 or 8 you'll be moved up to Windows 10 Pro, otherwise you'll receive the Home edition (see Windows 10 for business, opposite, for a rundown of the differences).

JON HONEYBALL'S 5 REASONS TO UPGRADE

1 LATEST DESIGN OF UNDERLYING KERNEL

The Windows 10 core is literally years ahead of previous editions: don't you want to take advantage of the latest in performance and security?

2 RETURN OF THE DESKTOP

Windows 8 was designed for tablets, and ignored the needs of the rest of us. Now it's time to get some work done.

3 LATEST SPECS IN POWER MANAGEMENT

Battery life is a huge issue for mobile devices –

and businesses running banks of workstations don't want to waste energy either.

4 LONGEST SUPPORT WINDOW

If Microsoft is true to its word, Windows 10 Pro comes with perpetual support. Where else can you get such a deal?

5 IT'S NOT VISTA OR WINDOWS 8...

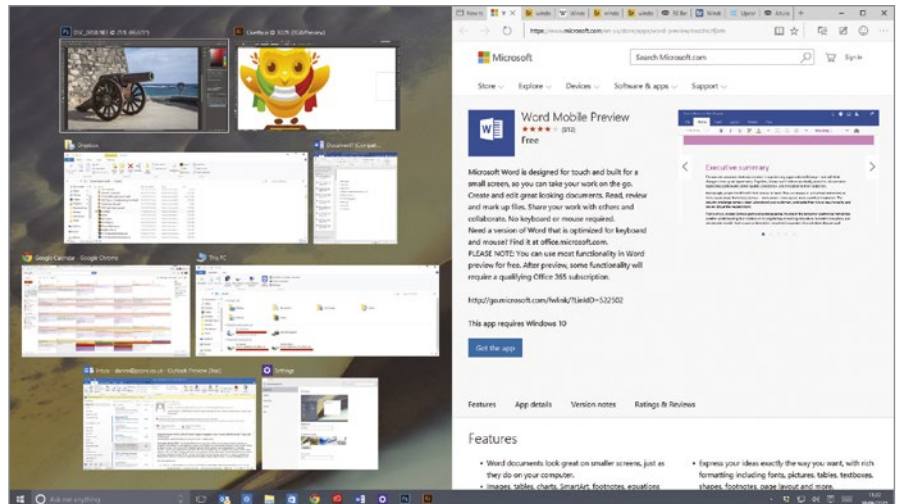
Historically, Microsoft gets some things very right, and others decidedly wrong. Let's rejoice that Windows 10 falls firmly into the former camp.



▲ The new Battery Saver helps mobile devices spend longer on the go

The new OS refines the touch controls, replacing the awkward edge-swipes of old with multi-finger gestures. Plus, while Universal apps can be made compatible with Windows 8.1, we anticipate that developers will focus on Windows 10: Microsoft has led the way, releasing previews of the Office, Excel and PowerPoint mobile apps as Windows 10-only.

The only constituency with a good reason to stick with Windows 8 is Media Center users. The much-loved media manager has been discontinued in Windows 10, considered redundant in an age of smart TVs and Xbox One media apps. Everyone else will surely be happier and more productive after the upgrade.



▲ Snap Assist makes it easy to work with two documents side by side

If you're currently using Windows 7, you may be more apprehensive. The veteran OS still does a perfectly good job, and if you've been using it for this long without feeling the need for mobile-type apps, you may not be eager to jump onto a platform designed for a different world. That will surely be the case if you're using Windows 7 for work, as many are.

But although Windows 10 aims to be more than just a desktop OS, Microsoft knows that the non-touch, standalone laptop is still the most common Windows platform. You can still use the Start menu as before, and run all the same applications: there's a slight learning curve involved in the new Settings app and the Edge browser, but to offset that you get

the benefit of the new Explorer features. It's easier than you might think to keep on trucking.

Upgraders from Windows 7 will also gain all the best features introduced in Windows 8: the enhanced Task Manager provides a welcome insight into system activity, and OneDrive – with a generous 15GB of free space – makes it easier to hop between devices. There's improved multimonitor support, and the File History system that permits continuous backup to a connected external or network drive. And that's in addition to much faster startup and reboot times. All told, Windows 10 makes a better desktop OS than Windows 7.

There's one more consideration: Windows 7 is now out of mainstream support. Security patches will continue,

WINDOWS 10 FOR BUSINESS

Companies running Windows 7 or 8 Pro can upgrade their desktop clients via the free upgrade programme, while those on a volume licensing agreement can roll out Windows 10 Enterprise whenever they want. By now the feature set will be familiar: the professional releases include everything in the Home edition, plus BitLocker encryption, Hyper-V, group policy management, domain support and the ability to act as both client and server in a remote desktop session.

These editions of Windows 10 also feature Windows Update for Business, which frees businesses from having to keep the OS constantly up to date. Devices running Windows 10 Pro have the option to switch to an update stream entitled "Current Branch for Business", which allows non-critical updates to be deferred to allow time for testing. Note that they can't be skipped altogether, and it remains to be seen how long the window will be in practice.

Windows 10 also introduces the new

idea of Long-Term Servicing Branches (LTSB) – builds of the operating system that can optionally receive critical updates but don't otherwise change at all. New branches will be issued periodically, and will receive mainstream support for five years after their issuance, with a further five years of extended support available. Only Windows 10 Enterprise – and the Education edition – have access to these branches. LTSB installations of Windows 10 Enterprise also come with Internet Explorer as the default browser rather than Edge, to maintain compatibility with legacy applications, while Pro users have the option of using either.

When it comes to device management,

Windows 10 builds on Windows 8, with new options for administering company-owned hardware: there's support for managing multiple users on the same device, using a container model. Clients can also log in using their Azure IDs, and connect directly to Azure Active Directory resources.



Finally, Windows 10 brings the ability for firms to curate their own app stores, for easy distribution of bespoke apps. Of course, this requires an investment in the Universal app platform, but since these apps are lightweight and sandboxed, and easy to assemble in a visual environment, it's a good fit. It doesn't hurt that they'll also run on Microsoft smartphones – as well as tablets and laptops – once Windows 10 Mobile arrives.

10 GREAT NEW FEATURES IN WINDOWS 10

IF THE START MENU, CORTANA AND EDGE AREN'T ENOUGH, CHECK OUT THESE ADDITIONAL ENHANCEMENTS

1 The Action Center slides in from the right of the screen with a fuss-free tap, letting you review recent alerts. You can also easily access settings such as brightness and networking.

2 The Task View button gives an instant overview of your windows, from which you can click to jump directly to a particular application or document.

3 For those who like to compartmentalise their windows, a new virtual desktop feature lets you set up and switch between workspaces.

4 The Settings app offers almost every adjustment you'll want to make – ending the confusing split between the control panel and Windows 8's full-screen PC Settings interface.

5 The Quick Access section in Explorer windows lets you jump instantly to recently accessed folders – one of those capabilities that quickly becomes indispensable.

6 The Battery Saver feature dims the screen and disables app features

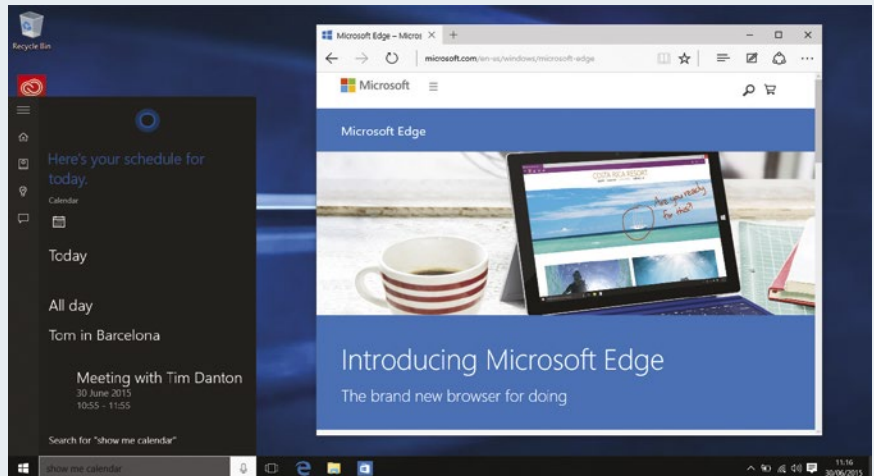
when your battery charge falls beneath a certain level. It can also track how much battery power individual applications have used.

7 Windows Hello lets you log on biometrically, using hardware such as a camera or fingerprint reader, while the new Passport framework carries your identity forward to applications and websites.

8 System files are compressed to save space on compact devices.

9 Windows 10 can connect to your Xbox One console, allow you to stream and record console games on a tablet or PC.

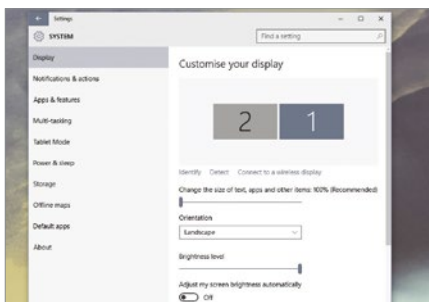
10 For gamers, DirectX 12 promises improved performance, through a new architecture that gives developers better access to the graphics hardware.



but otherwise the software is frozen, and in 2020, it will stop being supported altogether. By contrast, Windows 10, with its rolling update model, should never expire – so there's every chance you'll want to get onboard sooner or later. That being the case, it's a good idea to claim your upgrade while it's free. It's conceivable that Microsoft might end up making the OS free forever – but we wouldn't bank on it.

For those running a Windows 10 Insider Preview build, your upgrade options depend on how you installed your preview. If you upgraded from Windows 7 or 8, then you'll get the option to install the full release when it's available; if not, you'll

✓ The Settings app makes a tasteful alternative to the old control panel



need to reinstall your old OS to upgrade. Otherwise, you'll continue to receive preview builds of forthcoming updates indefinitely.

LOOKING FORWARD

As we've indicated, switching to Windows 10 isn't a one-off change; it's a step onto a perpetual conveyor belt of upgrades. The first update is expected as soon as this autumn – perhaps updating the Edge browser – with a more substantial update coming down the line next year.

That being the case, you might understandably be concerned that your hardware could start to struggle as the OS develops. The user experience could be volatile too: Microsoft has already showcased the idea of interactive Live Tiles for a future update. With a few changes like that, Windows 10 could morph into something quite different to the platform before us today, and there's no guarantee that we'll like it.

Yet there are reasons to be upbeat. So far, Microsoft has shown good taste with Windows 10, listening to customer feedback through the Insider Hub app. And since the Insider Programme continues after the formal release of Windows 10, volunteer testers will have a

chance to flag up any disastrous decisions before they're rolled out to regular users.

So overall, Windows 10 is a hit. On the desktop it feels as right as Windows 7, yet it's equally at home on compact tablets. Is it the perfect OS? No: Cortana falls some way short of the perfect virtual assistant, while aspects of the design lack slickness.

MAKE THE JUMP

But it's absurd to focus on such little things when the significance of Windows 10 is so big: if universal apps take off as they deserve to, that will be a persuasive reason to consider Windows 10 for your next tablet or smartphone. Even if that doesn't happen, Windows 10 is still – without a shadow of a doubt – the best OS for any desktop, laptop or convertible that's capable of running it.

If you haven't already claimed your upgrade, hesitate no longer and jump in with confidence.

Darien Graham-Smith

KEY SPECS

Upgrade from Windows 7 SP1 and 8.1, free

OVERALL





MSI GT80 TITAN SLI Gaming Laptop

BOLD, BRASH AND BLOODY BIG

Thanks to Nvidia's focus on power efficiency, today's gaming laptops are smaller than ever. The Maxwell design found in many of Nvidia's GPUs are extremely conservative when it comes to power consumption and thermal output, enabling a range of ultra-thin gaming laptops that won't break your back if you decide to lug them out of your home. MSI has gone against the grain with the new GT80 gaming laptop, harking back to the good old days when a gaming laptop required extra supports to stop your desk from collapsing. This thing is massive; it's a good thing that it's also massively overpowered.

This is the first gaming laptop we've seen that comes with a full-sized mechanical keyboard, and Cherry MX Brown switches provide sublime tactile feedback. The touchpad to the right of this doubles as a numpad, with the number keys glowing into life when you switch it to numpad mode, which will be the preferred config for gamers using an external mouse. The huge 18.4-inch screen is arguably this machine's one and only weakness, as it uses the rather lacklustre resolution of 1920 x 1080. At this price, and these dimensions, 2560 x 1440 would have been much more desirable, especially as this laptop has the guts to power so many pixels.

The onboard audio system is surprisingly capable, using four speakers and a tiny sub to deliver sound that is actually usable. These have been paired with MSI's Audio Boost 2 audio subsystem, which uses premium capacitors and amps to deliver a better sound signal from the onboard Realtek audio. Serious gamers will want to adopt headphones, as even the GT80's decent speakers aren't in the same league as a good set of cans. When doing so, MSI's exclusive license of Nahimic surround sound technology delivers a good 3D representation of the soundscape over stereo headphones.

With a weight of 4.5kg, it's obvious that MSI has stuffed this bad boy to the gills with hardware, but even we couldn't have imagined just how sky high this laptop's specs would be. The Intel i7-4720HQ is quite common in gaming laptops, with its Turbo speed of 3.6GHz and quad-cores being more than enough for today's games. However, MSI has paired it with a generous 16GB of DDR3 memory, and that generosity extends to the storage subsystem. Our review sample came with 485GB of usable RAID 0 SSD storage, along with 675GB of mechanical storage (the HDD has since been updated to a Terabyte). Obviously a Blu-ray writer comes standard, while Killer's brand new

Double Shot pro handles both Ethernet and Wi-Fi connections.

Where this machine blows the competition out of the water is its graphics prowess. MSI has slapped not one, but two GTX 980M GPUs into this beast, giving it more than enough grunt to carve through the latest and greatest games at Ultra Detail levels. This uses Nvidia's original Maxwell design, with a healthy 1536 Shader ALUs and 96 Texture Units a piece. 8GB of onboard memory is included, but each GPU only has access to 4GB, and due to the vagaries of SLI it means games can only access 4GB of graphics memory at a time (DX12 should change this). On paper this puts the GTX 980M in the same league as the desktop GTX 770, which remains a relatively solid performer despite its age.

These twin GPUs can be tasked with driving four different panels, but for our benchmarks we stuck with the 18.4 inch display. 3DMark FireStrike saw the GT80 blitz to a record speed of 10360, making it the fastest laptop we've ever tested. Grid AutoSport posted a similarly impressive result, with an average framerate of 112, dipping down to 82 at its worst. Finally, we fired up Metro 2033 to really punish this laptop, and were amazed at the end result. An average of 91fps is unheard of, even in many desktops, showing that the GT80 will handily cream the likes of Battlefield 4 or The Witcher 3. We didn't even bother with a battery test, as the results are predictable – expect an hour or less given the crazy-fast hardware within. But to buy the GT80 with the intent of gaming on the go would be missing the point. This brute brings desktop performance to a slightly mobile package, perfect for bringing to a mate's place for an impromptu LAN.

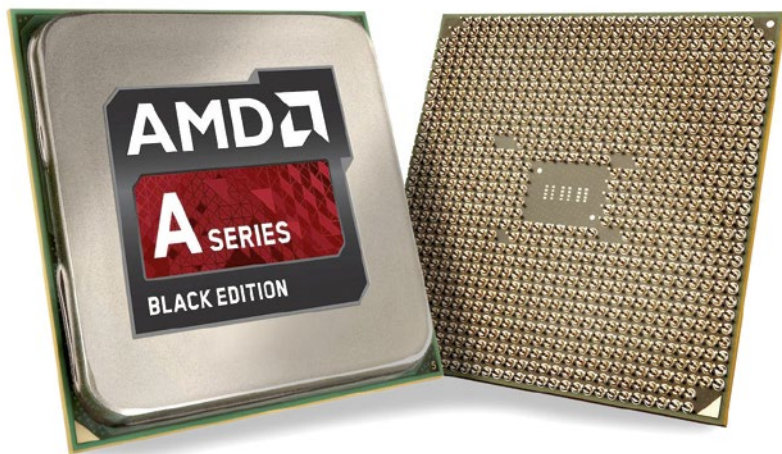
Bennett Ring

KEY SPECS

\$5499 • www.msi.com.tw
18.4" 1920 x 1080 display • 512GB RAID 0 SSD • 1TB HDD •
Intel i7-4720HQ CPU • 2 x Nvidia GeForce GTX 980M GPUs

OVERALL





AMD A10 7870K

AMD'S APU GETS A MINOR SPEED BOOST

AMD could do with a win right about now. The recent launch of the Fury X graphics card failed to put Nvidia's GTX 980 Ti back in its place, and it has consistently lagged behind Intel in the CPU and APU race. This month saw the release of Intel's i7 5775C, which we've reviewed opposite, at the same time AMD has dropped the new A10 7870K APU into our laps. With Intel going all out on the 5775C's integrated GPU, we were very keen to see if AMD had brought anything as important to the arms race. Sadly it appears not.

The architecture of this APU has been codenamed Kaveri Refresh, as it's simply an updated version of the existing Kaveri architecture. Much to our dismay, it does not feature the new Excavator cores found in AMD's Carrizo design, which were rumoured to be migrating from its laptop processors to the desktop. Instead AMD has dusted off the Steamroller CPU cores that have failed to excite users since their introduction in early 2014. This means it's basically a Kaveri core, but AMD has made a few minor tweaks to the chip.

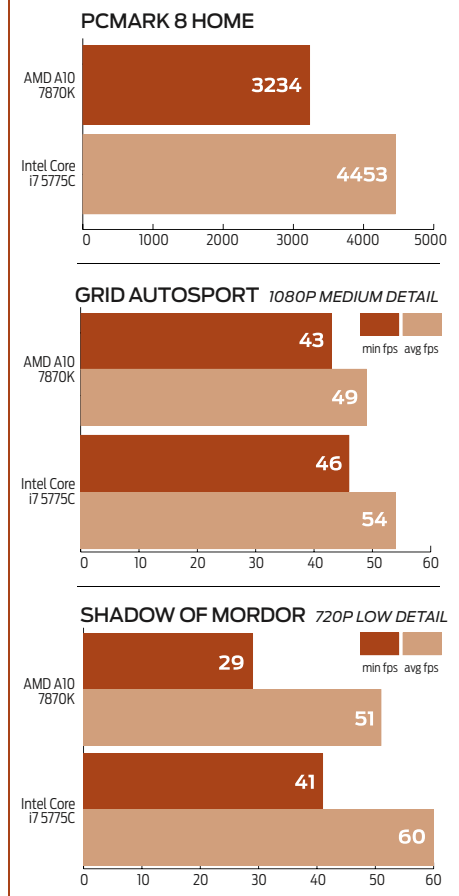
Four compute cores (aka CPU cores) reside alongside eight GPU cores, and the former tick along at a brisk 3.9GHz as a base, increasing to 4.1GHz during heavy workloads. The GPU cores have been given a bigger upgrade though, with their speed increasing from prior Kaveri chips' default of 720MHz, up to 866MHz, a healthy 20% leap. This increase in speed is to be expected given Kaveri's age, as AMD has obviously ironed out any quirks in the manufacturing process. AMD has apparently also increased the voltage to the GPU by 0.05V, small enough that the entire APU maintains the same TDP as its 7850K predecessor, at 95W. Unlike Intel and its spiffy new 14nm manufacturing

process, AMD is still languishing on the aging 28nm process, which explains the significantly higher TDP when compared to the likes of the i7 5775C, which comes in at 65W. Like its predecessor, this chip uses the FM2+ socket design.

The GPU side of this chip is identical to the 7850K bar the speed boost. This means it's using AMD's Radeon R7 cores, which are based on its GCN 1.1 version. 512 Stream Processors are squeezed onto the chip, which is less than half that of the entry-level discrete GPU, AMD's Radeon R7 270. As such, don't expect discrete-level performance, and our benchmarks show the iGPU being handily beaten by Intel's new 5775C.

What our benchmarks don't show is that the 7870K can be paired with a very cheap GPU such as the R7 250 and run in CrossFire mode, yet still be more affordable than a system with Intel's i7 5775C without a discrete GPU. The R7 250 can now be bought for just \$80, making the combined cost of that GPU and the 7870K just \$290, well below the Intel CPU's price of \$575. Unfortunately we didn't have an R7 250 on hand to test performance in this setup, but online benchmarks suggest that the CrossFire configuration will beat Intel's 5775C by around 10 to 20% in games, all while costing \$285 less. Unfortunately CrossFire doesn't work with the latest round of R7 products, instead being limited to the R7 250 GDDR3, R7 240 DDR3 or R7 240 GDDR3 graphics cards. However, DirectX 12 will bring a unique feature called Multiadapter or Asymmetric Rendering. Unlike CrossFire or SLI, this doesn't allocate entire frames to each GPU; instead, the assets in the frame can be handed out to each device, based on that device's performance. For example,

INTEL VS AMD BENCHMARKS



in a shooter, the APU might handle the gun model, while the discrete GPU might handle the world and enemies. It's an intriguing concept, but one that will be at least a year away from hitting the mainstream, if at all.

As our final benchmark illustrates, PCMark 8 Home, the A10 7870K isn't in the same league when it comes to raw CPU performance. Gamers looking for a meaty CPU to back up their discrete GPU will still find Intel to be their weapon of choice. However, when paired with a very affordable entry-level GPU such as the R7 250, the A10 7870K offers a remarkably affordable gaming solution, albeit one that now has to deal with AMD's less than stellar driver support.

Bennett Ring

KEY SPECS

\$210 • www.amd.com/au
Quad-core • 3.9GHz base, 4.1GHz Turbo • 2133MHz DDR3
memory support • Socket FM2+

OVERALL





Intel Core i7 5775C

INTEL TAKES THE iGPU LEAD, FOR A PRICE

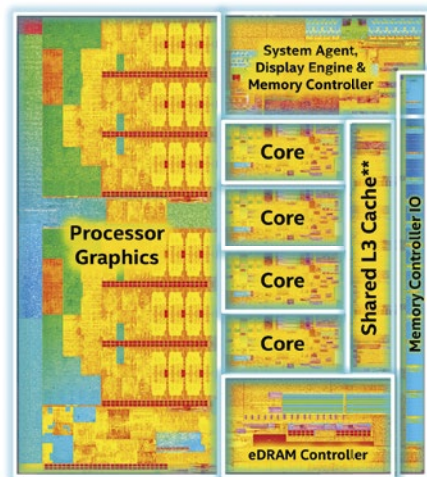
Broadwell has been a long time coming to the desktop, but it's finally here in the form of Intel's i7 5775C. It's the codename for Intel's move to a 14nm manufacturing process, known as a tick in Intel's tick/tock cadence, and has been long overdue thanks to production issues. While laptops have benefited from Broadwell's power-sipping process since late-2014, it's only now that desktop users get to see what all the fuss is about. And while the move to 14nm is impressive, it's the beefed up Iris Pro graphics in this processor that steals the show.

First, the basic specs. This is a quad-core, HyperThreaded CPU, with a base frequency of 3.3GHz and Turbo Boost speed of 3.7GHz, and 6MB of L3 cache. The TDP of just 65W shows just how cool the new 14nm process is. The older i5-4690K, which runs at similar speeds, has a TDP of 84W, and yet it doesn't have anywhere near as much silicon devoted to the integrated GPU. It supports DDR3 memory up to speeds of 1600MHz, though motherboard makers can get around this easily enough. It can serve up to 16 lanes of PCI Express 3.0, while it's still using the Socket 1150 design of the last generation. Don't expect to just slap it in any old Socket 1150 motherboard though; when we installed it in our Asus

Maximus VII Hero, games would crash and the system would spontaneously lock up. It turned out that a BIOS update is necessary for most motherboards to support this new chip. Despite the lack of a K in the name, this CPU is multiplier unlocked, making overclocking a breeze.

Where it gets really interesting though is the inclusion of Intel's Iris Pro Graphics 6200. As you can see from the die map, approximately half of the silicon in this CPU is dedicated to the graphics

✓ As you can see, the Broadwell design has half its space dedicated to graphics



processor, a huge step up from prior Intel iGPUs. Compared to prior versions of Iris Pro, such as the 5200 used exclusively in Apple's Macbook Pro and iMac, the number of execution units has increased from 40 to 48. It's an even bigger leap from the HD Graphics 4600 commonly found in Intel-powered laptops, which only had 20 execution units. The GPU has a maximum frequency of 1150MHz, which is slightly down on the 1250MHz of HD Graphics 4600, likely due to the increased complexity of the iGPU. A whopping 128MB of eDRAM serves as an L4 cache, and this can be accessed by the iGPU to help mitigate the slow speed encountered when accessing the system's memory.

AMD has held the integrated graphics crown for several years now thanks to the powerful GCN cores in its APU range, but Iris Pro Graphics 6200 promises to change all that. To test its performance we first fired up Grid AutoSport, at a resolution of 1920 x 1080 with the preset graphics options set to medium. No dedicated graphics card was installed in the test system, with all graphics being piped directly from each motherboard's HDMI output. The Intel i7 5775C had a handy 10% performance lead over AMD's new A10 7870K, with an average framerate of 54fps. Next off the benchmarking rack was the demanding Shadow of Mordor, and due to its high performance hunger we lowered the resolution to 1280 x 720, with low graphics details. Once again Intel posted the win, this time by 18%, leaving us in no doubt as to which is the better CPU for gaming overall.

Our final benchmark was the system-wide PCMark 8 Home, where Intel's superior raw CPU performance saw it beat the AMD chip by a whopping 38%.

However, it's worth pointing out that the Intel chip is twice the price of AMD's new processor; while Intel might have taken the iGPU performance throne, it cost them a pretty penny to do so. There's also the fact that this CPU is so late that Intel's next CPU, Skylake, looks set to make it obsolete in the next month or two. As a result, we'd highly recommend holding off on your next CPU upgrade until we see what Skylake can deliver.

Bennett Ring

KEY SPECS

\$575 • www.intel.com.au

Quad-Core • HyperThreading • 3.3GHz base frequency, 3.7GHz Turbo Boost frequency • Socket 1150

OVERALL





Alienware Area-51

EYE-WATERING PERFORMANCE FOR AN EYE-WATERING PRICE

When someone spends big money on a BMW with the same power as, say, a Commodore, there's this general understanding that the BMW is, in some way, worth the massive premium. There's a perception (possibly exaggerated) that it has superior engineering, a nicer interior, maybe better handling. Most importantly, it has a badge that tells everyone you're "getting ahead". The Bimmer might not actually, empirically *be* better than the SV6, but the point is that enough people *think* it is. So the money is at least understandable, if not necessarily worth it.

I'm not sure the same applies to desktop PCs. This latest snazzy iteration of Dell/Alienware's venerable Area-51 demands a fairly enormous extra chunk of cash over a machine with identical performance but none of the style, built by that weird guy with the skin condition in the little shop out the back of the suburban arcade.

Yes, you get a proper warranty. Yes, you get a nicely made case that looks like nothing else and has a very nifty lighting system where you can set individual LEDs to individual colours via custom software. Yes, you get a bunch of other Alienware "control centre" options that are slicker versions of the temperature and fan

speed monitors that come with the kind of motherboard that has a lightning bolt on the box. Yes, you get a marketing spiel that claims the tech boffins at Dell have tweaked the registry so this thing runs absolutely sleek and absolutely smooth.

And in the Labs this machine did perform well. Benchmarks aside, it's just really responsive. And when we switched it on, it booted straight to Desktop, no annoying Metro – sorry, Start Screen – to keep us from our games. That's some nice attention to detail, right there (though Metro pops up if you hit the Windows key – you still need to install Classic Shell or whatever yourself).

Price aside, this is a decently specced gaming machine. No complaints with the i7-5930K, or the 16GB of RAM. The 128GB system SSD is a little stingy, but it's backed by 2TB of traditional HDD. The GeForce GTX 980 in this one? That's a \$272.80 upgrade over the base price of \$3,999, and that's a sticking point.

When I drop four grand on a PC, I don't expect a single-card graphics solution, especially when that card isn't top of the range by default. Dell does have an SLI 970 config for an eye-watering extra \$811.80. I'm not sure if these cards produce a dizzying high, but \$800 for a second GTX 970 seems... well, it seems \$250-\$400 too steep, depending where you shop.

But this is all part of the same argument: a DIY box-o-PC-delights is always going to be cheaper. A *lot* cheaper. And it's *not* going to perform a hell of a lot slower than this Area-51.

Then again, the Area-51 isn't *for* the kind of gamer who likes to tinker around with

an anti-static strap and an iFixit 58-piece screwdriver kit. It's for people to want an expertly-pre-configured, warranty-backed dependable machine they can just turn on and play.

And it is that. The case design is striking and likely to resist invasive particulates in all but the dustiest of gaming dens. The slot-loading DVD player is neat for the two or three times a year you'll find yourself needing to use it... but again at this price it's alarming that no burner is included. Unnecessary? Sure, but also \$30 retail. Don't nickel-and-dime us Dell!

The included keyboard and mouse are okay – they match the case at least – but any serious gamer will substitute their preferred peripherals.

And so we come to the core problem with the Area-51. Maybe Alienware's notebooks offer enough to justify their price, but in this form-factor there's no sensible or compelling reason to buy this unless you're really, really scared of not having a whole-system warranty. And you luuuurv that funky case.

As a machine, this is a good PC. It's fast, it plays everything, and it looks cool. But to attract a price premium like this, it has to have everything you'll find a generic ATX and then some. Dell can't expect us to "make sacrifices", even meaningless ones like missing out on a DVD burner.

If you don't care about money and you love the look, buy the Area-51. It's a good PC. But is it a brand-built BMW M3 to a beige-box-special Commodore SSV? Hell no it's not.

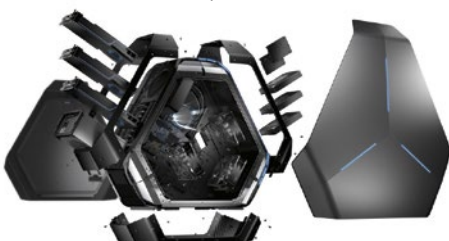
Anthony Fordham

KEY SPECS

\$4271.80 (as tested)

• www.dell.com/au/p/alienware-area51-r2/pd
3.5GHz i7-5930K (overclocked to 3.9GHz) • 16GB RAM • 128GB SSD + 2TB HDD • NVIDIA GeForce GTX 980 w/ 4GB GDDR5 • slot-loading DVD (reader only) • Alienware keyboard + mouse, custom case • CPU water cooling system • SD card reader.

OVERALL





DrayTek Vigor2925ac Dual-WAN Security Router

A FULL-FEATURED ROUTER WITH 802.11AC WI-FI
SUITABLE FOR THE ADVANCED HOME SETUP OR OFFICE

When stuffing around with Cisco or Juniper gear isn't appropriate or too expensive, network engineers tend to get DrayTek equipment instead. DrayTek's Vigor firmware is generally full featured, relatively easy to setup and the price is quite reasonable. The Vigor2925 is neat little unit that continues the DrayTek tradition of heaps of features at a comparatively low price for both home and business use.

The Vigor2925 range has a few different configurations - the base 2925 is a router with dual WAN ports, USB ports for 3G/4G modem connectivity and 5 gigabit Ethernet ports for switching. There's the 2925n and 2925n-Plus, which are the same as the 2925, just with 802.11n Wi-Fi (the n has a 2.4GHz radio, the n-Plus packs 5GHz and 2.4GHz radios). If you want 802.11ac wireless, the 2925ac fits the bill. Finally, there's a model with VOIP support and dual radio 802.11n Wi-Fi, the 2925Vn-Plus. A model with 802.11ac wireless and VOIP would be useful too, perhaps DrayTek will offer a model with those features in the near future.

The main differentiating factor between the Vigor2925 series and DrayTek's other routers is how many VPN

tunnels and NAT sessions each unit can support. The more VPN tunnels and NAT sessions supported, the grunter the internals - so more RAM and a faster CPU. There's other differences such as DSL modems, VOIP support, Fast Ethernet instead of Gigabit Ethernet, fewer or more Ethernet ports or different flavours of Wi-Fi. However, all the Vigor units have the same firmware and that's where it really matters. The firmware is where you spend all your time configuring features and fixing stuff when things go wrong.

The Vigor firmware has a feature list as long as your arm. Beyond the basics most routers have (DHCP server, NAT, QoS, Dynamic DNS), DrayTek has added some nifty features not normally seen on all-in-one routers at this price range. VLAN tagging, advanced VPN support such as trunking and PSK/X.509 certificate based authentication, a stateful packet inspection firewall with support for content filtering, support for multi-WAN failover and load balancing, including good support for 3G and 4G modems.

Something families with kids or a share-house will enjoy is the ability to add bandwidth limits and shaping based on traffic types - so you can allow basic web

traffic through or gaming, but cap Netflix or YouTube. Even set bandwidth limits on specific computers, so that if someone is constantly blowing the home's download quota, you can stop them from doing so.

In a business setting, the Vigor's ability to be centrally managed is very handy. If you've got a couple of these units out in the field, you can view the status of them all in a single management interface and configure them from the one spot. No need to log in to each unit individually. DrayTek call this the VigorACS SI - "Centralized Auto-Configuration Server for System Integrators".

Wi-Fi support in the Vigor firmware is extensive, with support for multiple SSIDs and VLANs, allowing wireless network segregation. If you have large or multiple areas that need wireless, the Vigor devices can even act as a centralised wireless access point management system. DrayTek sell stand alone wireless access points that you can spread around, linked back to the router and managed centrally.

These features are all great, but it comes at a cost. The Vigor2925ac has a street price of \$425. Compared to \$150 for a TP-Link Archer C7 AC1750 or \$335 for an ASUS RT-AC3200, is the DrayTek really worth the extra money?

For most home users, you should save the cash. The features that differentiate the DrayTek from the top end consumer routers are the enterprise ones. Unless you need dual WAN ports, automatic failover, advanced VPN support, highly configurable firewalls and centralised management and logging, you're wasting your money.

If you do need those advanced features, then the Vigor is a lot more interesting. There are the low end options from the big players, like the Juniper SRX110, Ubiquiti EdgeRouter and the Sophos SG105 - each with their own unique use cases and features. The Vigor 2925 stacks up very competitively with those on price and is very easy to configure. If you're a home user looking for something more advanced or a business user after something easy to configure with the features you need, the Vigor 2925 should definitely be on your list.

Anthony Agius

KEY SPECS

\$425 • www.draytek.com.au
Dual WAN router • 802.11ac AC1300 Wi-Fi • 2x USB ports • 6-port Gigabit Ethernet switch.

OVERALL



OCZ Trion 100 Solid State Drive 480GB

SPEED, ENDURANCE AND IMPRESSIVE AFFORDABILITY

OCZ is continuing its resurgence as a major player in the SSD market. In the past, its RAM modules and Vertex series of Sandforce-controlled SSDs were often vaunted for their performance, before the corporate wheels fell off in 2012. Luckily for OCZ (and us), Toshiba acquired the company in 2013 and now, under its watchful eye, it's surging again. The Trion 100 SSD is OCZ's new bang-for-buck entry in a competitive market.

SATA 3 SSDs have just about reached the point of bandwidth saturation, so manufacturers are looking for new ways to differentiate their products from the competition and add value in other ways. The performance gap between budget and performance SATA 3 drives has narrowed considerably, such that there's almost no reason pony up the extra cash for a premium SATA 3 SSD when a cheaper one will have similar

performance for a lot less money.

The Trion 100 SSD uses a Toshiba controller, which manages the Toshiba-supplied 19nm Triple-Level Cell (TLC) NAND flash memory, which is the value choice, compared to Single-Level Cell (SLC) and Multi-Level Cell (MLC) memory. Sourcing these components in-house has also allowed OCZ to price this drive very competitively, to the tune of just under 52c per gigabyte, in the case of this 480GB iteration.

In terms of performance, the Trion 100 is right up there with its competition, such as the Samsung 850 Evo and the Crucial MX200. Using AS SSD, we recorded sequential read speeds of 522MB/s and write speeds of 488MB/s; it's definitely no slouch. Not only is it quick, it's also durable, with the 480GB model being rated to write 110GB per day for a period of three years. That's just over 117TB over that period.



The SSD also comes with OCZ SSD Guru software, providing an easy-to-use interface for drive management. Don't expect any cloning software or mounting brackets, however. In the name of providing a price-competitive product, only the drive, some mounting screws and a manual are included in the box.

This gem is an SSD with near-premium performance at a budget price point.

Peter Gutierrez

KEY SPECS

\$79 (120GB); \$139 (240GB); \$249 (480GB); \$499 (960GB) • www.ocz.com

Toshiba 19nm TLC (Triple-Level Cell) NAND • Toshiba controller • SATA 3 (backwards-compatible with SATA 2) • 2.5in form factor, 7mm height

OVERALL



MSI GTX 980Ti Gaming 6G

THIS GTX 980TI SWEEPS ALL BEFORE IT

The surge of bespoke versions of Nvidia's GTX 980Ti continues.

For maximum single-GPU performance, the mighty Maxwell-powered 980Ti is the one to have at the moment, as we saw in our testing of cards over the last two issues (with the Gigabyte GV-N98TGI Gaming 6G earning a place in our Perfect PC). Until (and if) AMD releases a whole lot more performance with drivers, the 980Ti has bested the Fury.

MSI's card pushes the clocks even higher than the Gigabyte we tested. The Base speed is 1178MHz (Nvidia default is 1000MHz and the Gigabyte is 1152MHz), Boost is 1279MHz (default is 1075 and the Gigabyte is 1241MHz). So MSI has really pushed this GPU, and so far it has the highest factory overclock of any 980Ti we've seen. For low-load desktop work, the fan won't spin at all unless the GPU temperature passes around 60 degrees, and clocks drop into Silent mode, which mirrors Nvidia's standard reference speeds (albeit with an odd 1MHz more in Boost mode).

These clock speeds put this card ahead of the Titan X (assuming the 6GB of memory here is sufficient) and hundreds of dollars cheaper.

Power draw is around 250W. You will need two 8-pin headers — up from 6 + 8-pin specification on the reference card. With such aggressive overclocks this makes good sense. This card does empty most of its heat into the case, a consequence of supporting 3 x DisplayPort, 1 x HDMI and 1 x Dual-Link DVI connections, and thus having little room left on the back plate for a decent sized exhaust port. This port configuration also means you can run up to four monitors simultaneously.

DisplayPort really is taking over quickly as the default video connection standard for PCs, and a card with both DP and DVI is a handy thing to have.

A heavy metal and very well vented backplate protects the rear, and on the front the twin fans use a new design of blade where every second blade has a bit of a bend to improve air movement.

This is the new king of 980Ti cards,



with true 4K performance at reasonable detail settings. MSI has done a top job with the components and cooling, the cooling, and making a card that can handle ambitious overclocks.

You'll now find it in our Perfect PC build in Kitlog.

Ben Mansill

KEY SPECS

\$1089 • www.au.msi.com

6GB DDR5 • 3 x DisplayPort, 1 x HDMI and 1 x Dual-Link DVI

OVERALL



Synology DS215+ NAS

ANOTHER FINE NAS FROM THE MASTERS OF THE CRAFT

Considering it doesn't even come with hard drives, this twin-bay NAS is a rather pricey new product from Synology. But the company rarely focuses on price to remain competitive, instead delivering industry-leading performance and one of the best user interfaces on the market. The DS215+ continues this proud tradition, with version 5.2 of its DiskStation Manager (DSM) software bringing a suite of improvements to the table.

Before we look at the software, let's see what makes this NAS tick. A dual core CPU runs at 1.4GHz, and it's been paired with 1GB of RAM. Twin Gigabit Ethernet ports can be combined using Link Aggregation, which delivers a top read speed of 209MB/sec, while write speeds peak at 139MB/sec, though this will vary depending on the drives you use within. Both USB 3.0 and eSATA ports are included, but only one of each; we'd rather have seen another USB 3.0 in the place of the eSATA port.

Heading into DSM 5.2 reveals a

plethora of different features, far too numerous to mention here. They're incredibly easy to use, as the first screen to welcome new users has links to the most commonly used applications. These include a DLNA Media Server, Security settings, creating your own personal cloud storage, image sharing and automated backups. Each link has step by step instructions illustrated with numerous screenshots, making it foolproof even for novice users.

In addition to these apps, dozens more are freely available from the Package Center, with apps for virus scanning, mail serving, iTunes serving, Plex Media serving and even a surveillance station. We should point out that DSM 5.2 is a free upgrade for existing owners of Synology NAS devices, so there's no need to buy the DS215+ to access these new features.

It might cost substantially more than entry-level twin-bay NAS devices, but the DS215+ does substantially more than the cheaper competition. It's total



overkill if you just want an external drive for your network, but you'll be surprised at how many of its extra features are truly useful.

Bennett Ring

KEY SPECS

\$425 • www.synology.com

Dual core 1.4GHz CPU • 1GB RAM • Twin-bay • Dual Gigabit Ethernet with Link Aggregation • 1 x USB 3.0, 1 x eSATA

OVERALL



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Adobe Creative Cloud 2015

ANOTHER ROUND OF UPDATES FOR ADOBE'S CREATIVE CLOUD SUITE, INCLUDING AN INTRIGUING GLIMPSE OF THE FUTURE

Last year's Creative Cloud update was the most significant since the inauguration of Adobe's subscription payment model; 2015's "milestone" release is less extensive. The applications do benefit from updates, but the biggest development doesn't relate to the suite's major applications. Instead, the major addition in CC 2015 is a new service that plugs into those apps: having already extended the suite with the Typekit font library, Adobe is now getting into stock photography.

ADOBE STOCK AND LINKED ASSETS

If the bank of images, illustrations and vectors in Adobe Stock looks familiar, there's good reason. Its 40 million or so images come directly from Fotolia, acquired by Adobe earlier in 2015. It won't have had much chance to stamp its own ethos on the content just yet.

Rather, the work has been on integration with the Creative Cloud apps, and here Stock works in a similar way to Typekit. At its simplest, you can carry out a keyword-based search from the Adobe Stock website, and then download images in the browser. But this is possible with any stock-image website; the advantage of Adobe's offering is that you can carry out searches within the Creative Cloud applications. Search results appear in a web browser, but selected images are then imported into your Creative Cloud Library folder, which can be accessed within the CC

✓ Adobe Stock allows you to search for photos from within its applications

applications themselves.

It's important to note that Adobe Stock isn't free to Creative Cloud subscribers. Single images cost \$11.99 each, while the basic subscription costs \$59.99 per month for up to ten images; these prices won't scare other photo providers.

Stock's big selling point is that users can download and work with free watermarked images within Photoshop, Illustrator or InDesign, then seamlessly update those images with the full-resolution, non-watermarked versions by simply clicking the "License image" option in the Library panel. That's certainly an improvement over most stock-image workflows, but Adobe's system needs some work. For instance, the web interface is basic, yet still manages to confuse. If you click on an image for a closer view, the option to save directly into your libraries disappears. And while working with watermarked photos is fine, it's not as effective for vectors, as you can't tweak elements until you purchase the photos.

Another new cross-CC feature is Linked Assets. This builds on CC's existing Libraries features, allowing users to keep commonly used graphics up to date across multiple projects. Edit the graphic, save it into your library and, as long as that graphic has been placed as a linked item, it will instantly update across all the projects in which it's been used.

PHOTOSHOP AND LIGHTROOM

With all the work going on in Stock, the major apps haven't received as much attention. Photoshop's big new feature isn't new at all – it's inherited from

Illustrator. The Artboards feature allows you to set up several differently sized workspaces within a single PSD file. It's aimed at those designing artwork for several device types at the same time – for an app and a responsive website, for example.

You get presets based on popular devices and screen sizes, plus the option to define your own custom artboards, should the need arise. The most powerful feature of Artboards is its ability to work in conjunction with the new OS X-only Device Preview app, which can pipe previews directly to USB-connected iPhones and iPads for a real-time, real-world preview.

Both Photoshop and Lightroom gain a new tool as well. "Dehaze" proves remarkably adept at adding clarity to photos that are low on contrast. It can also be used to add haze to an image for a more dreamy quality. The standalone Lightroom 6 product won't receive this update; it's for CC subscribers only.

Elsewhere, there's an overhaul of the Layer Styles box, so you can now add multiple instances of the same effect to a layer – allowing the creation of multilayered drop shadows, for example. The Photomerge tool can now take advantage of Photoshop's Content-Aware Fill feature to fill in the jagged curves along the top and bottom of multi-photo panoramas – a feature that has already been in Photoshop Elements for years.

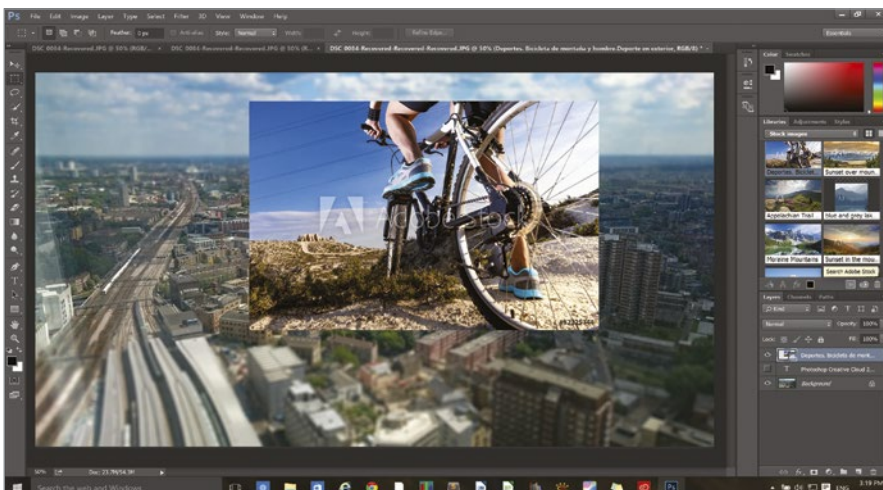
There's also an interesting preview feature dubbed Design Space, which is essentially a cut-down Photoshop UI implemented in HTML5. It's too simple for serious use, but in a world increasingly moving to platform-independent tools, it's a fascinating hint that the ultimate endgame for Creative Cloud might be online apps.

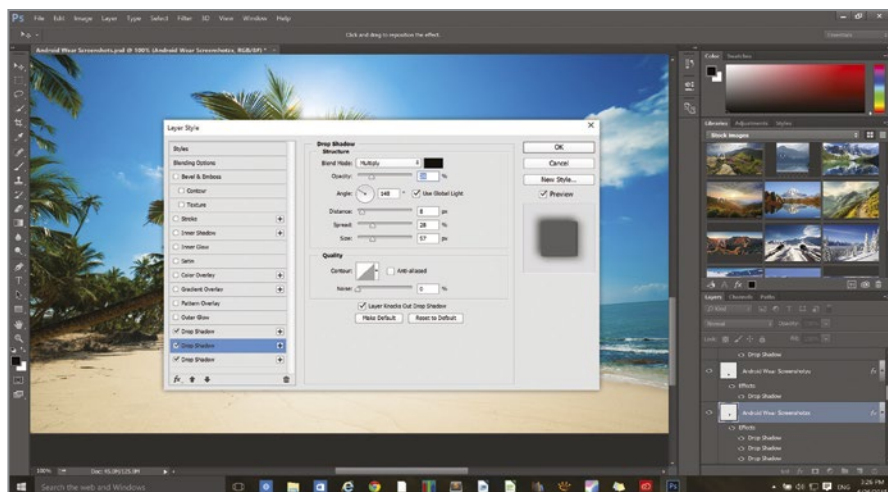
ILLUSTRATOR AND INDESIGN

While the photographic applications get some decent new features, the rest of the core apps haven't been so lucky. Headlines for Illustrator include a performance boost and a (currently) limited update to the charting tools.

The former comes thanks to GPU acceleration, allowing real-time click-and-drag panning and zooming – just like Photoshop, in other words.

The new Creative Cloud Charts feature is part of Adobe's "Technology





“Illustrator gains a crash-recovery feature, so if you run out of battery mid-task you can now pick up where you left off”

one enormously practical, yet rather dull, update and a couple of more eye-catching changes. The first will have an enormous impact on anyone who spends their days in After Effects: at last users can make changes to an open project – adjusting parameters and so on – while a preview is playing, without it pausing.

The Face Tracker and Character Animator features are a bit more fun. Face Tracker allows you to apply effects to people's faces within a clip and have them follow that face around the frame. It's handy if you need to blur out a child's face in a news clip, for example, and features such as the eyes, nose and mouth can be tracked independently.

That data can then be exported for use in the new Character Animator application, currently in preview. With this application, you can either use captured facial information from After Effects to animate 2D characters' features, or use your webcam to capture facial movements and apply them in real-time.

VERDICT

Other changes of note include Dreamweaver's improved tools for responsive website design, the integration of Typekit with Adobe Muse and the introduction of the Adobe Photoshop Mix, Brush CC, Shape CC and Color CC mobile apps to Android. Other improvements are mostly small and incremental. Still, Adobe's applications are already so powerful, and Creative Suite so vast, that it continues to amaze me that Adobe can find anything at all to add or make better.

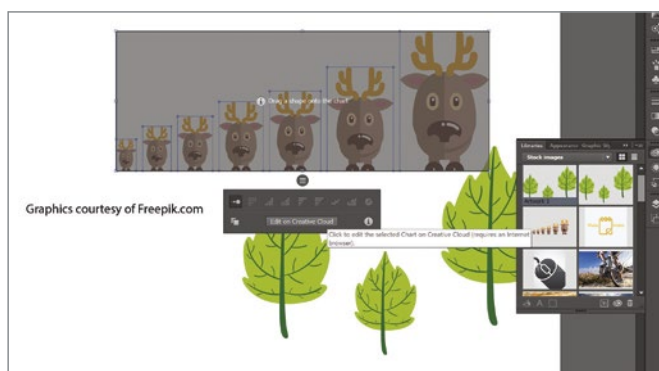
Perhaps features such as the new HTML5 Design Space interface, Creative Cloud Charts and the move into stock photography point the way. Bit by bit, Adobe is extending its behemoth online; it can't be long before Creative Cloud's entire centre of gravity starts to shift in that direction.

Jonathan Bray

KEY SPECS

\$49.99/month (Complete); 19.99/month (Single App); \$9.99/month (Photography) • www.adobe.com.au

OVERALL



- ▲ Create multilayered drop shadows using the Layer Styles box
- ◀ With Creative Cloud Charts, you can create infographics

Previews”, and as such, it's officially a work in progress. As the name suggests, this isn't a conventional upgrade, but a new hybrid, cloud-based service, which (peculiarly) requires chart values to be entered in a browser instead of a dialog box. The graphs appear in Illustrator as normal, but this isn't a regular graphing tool: it's aimed specifically at the creation of infographics, with the ability to scale graphics based on values, rather than using plain bars or columns.

Finally, Illustrator gains a crash-recovery feature, similar to that of InDesign. If you run out of battery mid-task or Illustrator crashes, you can now pick up where you left off when the app then restarts.

InDesign's major new feature is Publish Online, another Technology Preview, which lets you share documents over

- ✓ Add clarity to photos that are low on contrast using the new Dehaze tool



the internet via the browser. Available through the File dropdown menu, this mirrors your InDesign document to a publicly accessible URL, and can preserve even the most advanced features – such as animations and embedded video – all using the magic of HTML5.

PREMIERE PRO AND AFTER EFFECTS

The major changes in Premiere Pro focus on colour workflow. The app gains the real-time videoscopes previously only available in Adobe SpeedGrade, and there's also a new set of colour-correction tools via the Lumetri Color panel, opening up even more refined colour correction to videographers and film editors.

Slightly less universally important, but useful in certain circumstances, is the new Morph Cut feature. This uses face-tracking to remove material in interview sequences, and smooth out jump cuts by interpolating (morphing) between frames, with the idea that you don't need to apply a distracting crossfade or cut to B-roll. It works well: depending on the your subject's mobility, it can be tough to spot the transitions if you're not looking for them.

After Effects takes a similar tack, with

Labs Briefs

Lacie Mirror

\$439 · www.seagate.com/au

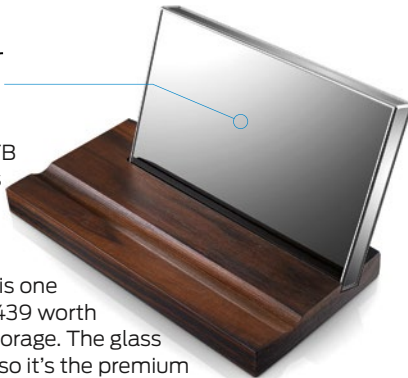
The first thing this 1TB portable drive does is catch your eye with its all-over mirror finish. That's what you're paying for. That's what this one is all about. This here is \$439 worth of high-design portable storage. The glass is Corning Gorilla Glass 3, so it's the premium stuff. It holds fingerprints like Scotland Yard, so you get a cleaning cloth and carry bag in the even more incredibly engineered cardboard box in comes in. There's an ebony desk stand with an extra groove for your Mont Blanc pen, too.

You need to run the included formatting software first; the slider makes it easy to adjust between FAT32 and NTFS, before offering to install a few encryption and backup tools to your PC. Formatted capacity is an honest to goodness 1TB. She benched at 109.1MB/s read and 93.2MB/s write via USB 3.0.

It's a bit disco and thoroughly unique. Someone out there reading this just fell in love...

Ben Mansill

OVERALL



Seagate Seven

\$189 · www.seagate.com/au

The bare steel case is almost shrink-wrapped around the internal spinner, and this very industrial style is unlike anything else in terms of funky coolness. Not a soul in the office was able to resist picking it up and having a feel. It really is quite lovely. The design has practical benefits. It's tough because it's steel and thin, so if you decide to use 10,000 of them to pave your driveway the data will probably be alright.

The thinness limits the number of physical disks inside, so capacity tops out at 500GB, which turns out to be 465GB of useable space. It benched at 103.1MB/s read and 91MB/s write using AS SSD, via USB 3.0, which is about right for a spinning hard drive.

There's a sense of solid industrial appeal about this one. We liked it.

Ben Mansill

OVERALL



Ainol Mini PC

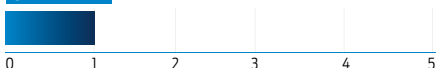
\$134.65 · www.ainol-novo.com

Small Form Factor PCs are gaining in popularity, but the Ainol Mini PC is a poor representative of the category. Its Intel Atom Z3735F Processor, 2GB DDR3 RAM and 32GB eMMC 'drive' are crammed into an enclosure smaller than a Blu-ray case, and runs Windows 8.1 64-bit. The Mini PC can also provide powerbank functionality to mobile devices, and the price is incredibly low. However, there's just no justifiable reason to pick this device over more accomplished SFF PCs that are currently available.

It has a microSD expansion slot that supports capacities up to 128GB, but the eMMC storage is painfully slow, and wireless connectivity regularly drops out and does not match its wireless-N claims. The adaptor connection into the unit is toothpick thin, and the Aus/NZ socket adaptor required for the other end is so loose it could pose an electrical hazard. The USB ports also drop their connections without warning.

Peter Gutierrez

OVERALL



Adata XPG SX930

\$105 (120GB); \$155 (240GB); \$349 (480GB)
· www.adata.com

A data has finally released a follow-up to its 2012 XPG performance SSDs with the SX930 series.

Managing the SATA 3 SSD is JMicron's new JMF670H controller, which promises performance close to Marvell and Samsung based SSDs. With sequential read and write speeds of 510MB/s and 443MB/s respectively, its performance is right up there; only during random reads and writes does it start to fall behind. An unfortunate trade-off by using this new controller is its drive size limitation of 480GB, which is difficult to swallow, given Adata's own value-oriented Premier drives offer 960GB iterations. The drive still employs MLC NAND flash memory, touting its reliability over cheaper TLC-based drives. Its 5-year warranty certainly gives weight to that claim.

Included in the box is a 3.5in bracket, 9.5mm spacer and mounting screws. Acronis True Image HD is also available as a free download, as is Adata's SSD Toolbox, to help manage and optimise the drive.

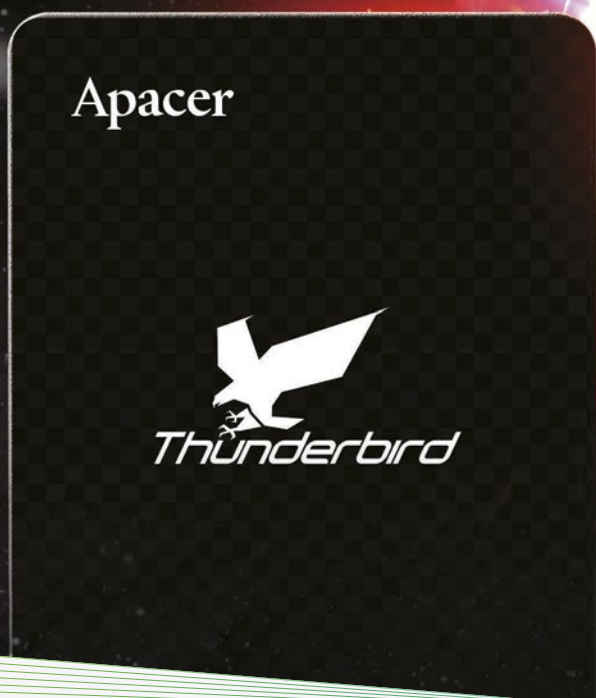
Peter Gutierrez

OVERALL



Apacer

Unleash Your Devastating Weaponry



BLADE
OC MEMORY MODULE

THUNDERBIRD
SOLID STATE DRIVE

SYD

J & W computers
<http://www.jwcomputers.co.uk>

MWAVE
<http://www.mwave.com.au>

MEL

PC CASE GEAR
<https://pccasegear.com>

Centre Com
<http://www.centrecom.com.au>

Scorpion
<http://www.scorpTec.com.au>

QLD

Umart
<https://www.umart.com.au>

Computer Alliance
<http://www.computeralliance.com.au>

PERTH

PLE Computer
<https://www.ple.com.au>

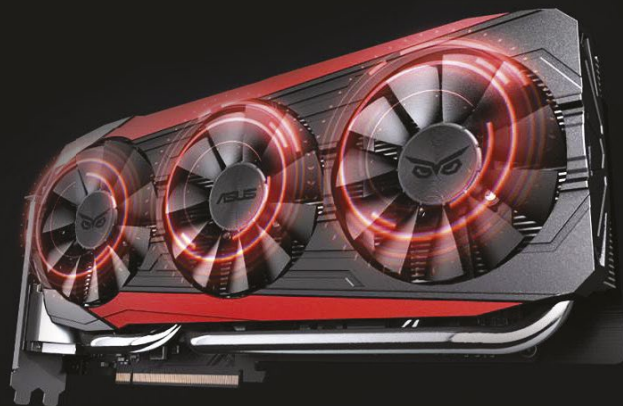
New Zealand

Mighty Ape
<http://www.mightyape.co.nz>

Playtech
www.playtech.co.nz
Xpcomputers
<http://www.xpcomputers.co.nz>
Just laptop
www.justlaptops.co.nz

AMD Radeon R9 300 Series

HOW DO AMD'S 'NEW' SUB-FURY CARDS STACK UP? **BENNETT RING** HITS THE LABS



Last month we were lucky enough to publish the Aussie exclusive review of AMD's new premium graphics card, the Fury X. Based on the existing Graphics Core Next (GCN) 1.2 design but built to a scale never seen before, as well as incorporating brand new High Bandwidth Memory, this speed demon sadly failed to quite beat Nvidia's GTX 980 Ti, though it came close. While we're still waiting to see what AMD does with the Fiji chip used in the Fury X, with cut-down versions due in two upcoming air-cooled products, the company has released a range of new R9 300 series graphics cards.

The thing is, they're not actually new – AMD has once again gone the rebrand path, rehashing GPUs from the last couple of years and slapping new names on them. We've gathered up four samples, but before we look at each card in detail, let's take a look at the newest features AMD has added to its Catalyst driver suite, most of which are compatible with the new R9 300 series of graphics cards.

Freesync

AMD's answer to G-Sync has finally arrived in force, with a decent range of FreeSync enabled monitors now available on Aussie shores. Like G-Sync, it slaves the monitor's refresh rate to the graphics card, only drawing a new frame on the screen when there's a full frame ready to go from the graphics card. This has a couple of benefits. Firstly, it allows games to be played at framerates lower than 60fps yet they still appear to run silky smooth. Around 40Hz/40fps is the bottom limit before the image starts to feel juddery. Secondly, it's possible to run at below 60fps without V-Sync, yet not suffer from horrible screen tearing,

the phenomenon that occurs when two frames are drawn onto a single screen refresh. Finally, traditional V-sync also removes screen tear, but brings stuttering and latency into the equation – FreeSync removes these.

The beauty of FreeSync is that it shouldn't cost as much as Nvidia's G-Sync, as it relies upon the open standard of DisplayPort 1.2a, which incorporates Adaptive-Sync. We're still trying to determine precisely what the difference between FreeSync and Adaptive-Sync is though, as there's a mish mash of conflicting information out there.

We're speaking to experts at various key manufacturers and will have the answer for you in next month's issue. Until then, bear in mind that FreeSync tends to have a lower operating window than G-Sync, with displays such as Asus' MG279Q only supporting FreeSync between 35Hz and 90Hz. It's also only compatible with GCN 1.1 and above products, which is an issue for older AMD cards.

Virtual Super Resolution

AMD has finally jumped onboard the downsampling bus, a technique used to render a game at a higher resolution than that supported by the display. Doing so reduces aliasing, aka jaggies, especially in games that don't have the best anti-aliasing support.

In the past it required users to fiddle with custom resolutions and display timings, but AMD has now made it a simple setting in the Catalyst control panel. It's called Virtual Super Resolution, and is how we tested the cards included in this group test at 2560 x 1440 resolution running on a 1920 x 1080 display.

Mantle is Dead

As of the release of the Fury X, AMD has stopped actively developing Mantle support for new games. Instead Mantle is going to become the basis for Vulkan, which is the 3D graphics API for OpenGL. Most AMD products will also support DX12, with the exception of those based on very old GPUs. More about that later.

LiquidVR

With so much hype around the release of the Oculus Rift in early 2016, as well as new headsets like the StarVR with a huge resolution of 2560 x 1440 per eye, AMD has launched a low-latency feature called LiquidVR, which lowers the time between the player's head motion and the updated screen refresh (known as motion-to-photon). AMD claims LiquidVR allows for a motion-to-photon speed of less than 10ms, well below the 20ms benchmark established by Oculus as the baseline for a comfortable VR experience.

Frame Rate Target Control

The final feature we're going to talk about allows gamers to lock the uppermost framerate of their games. In the past gamers have had to rely on third party software to do this, but the Catalyst drivers now support this across all R9 300 series products.

On to the Products

Most of these features are available across all of AMD's new R9 300 series products, and are included in the latest 15.7 drivers. Fortunately these drivers are WHQL-certified, the first since December last year. We used these for testing the following products – let's see exactly what AMD is releasing, and how quickly they perform.



MSI Radeon R7 370 Gaming 4G

AN OLDIE, AND NOT NECESSARILY A GOODIE

Welcome to the crustiest GPU in AMD's new R7 300 series. While the name sounds all shiny and new, the GPU residing underneath its heatsink is anything but. While the performance isn't too bad for this price point, the age of the GPU brings some severe limitations to the party.

Those with excellent memories will recall AMD's Pitcairn architecture, which first debuted in 2012 in the form of the Radeon 7800 series. This means it's limited to AMD's GCN 1.0, and thus doesn't support FreeSync, TrueAudio (AMD's hardware accelerated audio codec, which is used by a mere handful of games) or hardware decoding of videos above 1080p.

Like most of the products in the rebadged 300 series, it shares much in common with its predecessor, which is the Radeon R7 275. The number of Stream Processors is identical, at 1024, as is the number of texture units, at 64. As expected, the ROPs too are the same,

with a total of 32. However, the boost speed of the GPU has been given a slight nudge, up from the 275's 925MHz to 975MHz in the 370, which is a mere 5% bump. However, MSI has increased this again in its variant of the 370. It can be run at three different modes, depending on which one the user selects in the MSI software; silent tops out at 975MHz, gaming mode peaks at 1030MHz, and finally OC mode runs at 1070MHz. That's a decent 10% increase over the default stock speeds.

The exact same memory subsystem from the 275 has been employed on the 370, with 5.6Gbps GDDR5 running over a 256-bit bus. The stock variant of this card uses 2GB of onboard memory, but MSI has doubled this to a rather generous 4GB. We're guessing it's more of a marketing tool than actually increasing the performance of the card though, as it's likely the GPU's limitations will come into play before more than 2GB of memory is required.

Despite the increase in speed, MSI claims the TDP of the card remains at just 110W, identical to stock R7 370 boards. We're guessing this climbs when the card is put into OC mode, but even then it remains a relatively chilly chip compared to the 250W roasters at the upper end of the spectrum. Power is fed to the card via a single six-pin power connector.

MSI has decked this card out with its proprietary Twin Frozr V cooler, which is basically overkill for such a low power

GPU. Like most new graphics cards, the fans don't spin up during 2D applications, only kicking into life once a 3D game starts rendering. Each fan uses MSI's Torx design, which splits each blade into two segments; a traditional blade for downwards airflow, and a dispersion section that blows air all over the full area of the heatsink.

When combined with the heatpipe design, the cooler on this card remains extremely quiet. We tested in gaming mode, and found it to be the quietest card in the roundup, pumping just 42dB of fan noise out. A small dragon logo on one edge lights up courtesy of LED lights, if that's your thing.

As far as outputs go, MSI has decked its card out with one DL DVI-I, one DL DVI-D, one HDMI 1.4a and one DisplayPort 1.2 output. That last output gives this card the ability to output 4K at 60Hz, but if gaming is the intent this is a pipedream for such an entry-level card. Up to three displays can be attached simultaneously, and a DVI to VGA dongle is also included in the box for owners who haven't upgraded their aging displays.

Despite the relatively diminutive GPU, this is a surprisingly large and heavy card, measuring 258mm x 132mm x 37mm, with a weight of 632 grams. This is largely thanks to the large cooler that MSI has employed; we'd love to see a smaller variant aimed at HTPC users.

Priced at \$269, MSI's R7 370 goes head to head against the likes of Nvidia's GTX 960, which can be had for the same price. We benched it against a Gainward GTX 960 Phantom, and the R7 370 got absolutely smacked down in both 3DMark FireStrike and Grid Autosport. It came a little closer in Shadow of Mordor, but at the end of the day the GTX 960 is the better product.

KEY SPECS

\$269 • www.au.msi.com

GCN 1.0 • 4GB DDR5 onboard memory • Twin Frozr 5 cooler • 1 x DVI-I, 1 x DVI-D, 1 x HDMI 1.4a, 1 x DisplayPort 1.2

OVERALL





Asus Strix R9 380 DCU2

ALMOST THE SWEET SPOT FOR PRICE/PERFORMANCE

If there's one product in the new range of AMD cards that offers stiff competition to Nvidia, it's got to be the 380. As you'll see it gives the GTX 960 a very good run for its money, but sadly this Asus variant scrimps on memory, causing it to drop behind similarly priced R9 380s.

Like all of the new cards, it's actually an older product with a new name. In this case, the R9 380 is actually a rehashed R9 285, which released at the tail end of 2014. Thankfully it's one of the newest GPU designs in the R9 300 family, as it's based on the Tonga GPU. This comes with full GCN 1.2 support, which avails users of all AMD's features. It'll also be fully DirectX 12 compliant and, depending on who you ask, actually has superior DX12 support compared to Nvidia's Maxwell 2.0 design.

Comparing the specs between the R9 285 and R9 380 reveals the same story as most of the other R9 300 cards, with everything being basically identical. 1792

Stream Processors power both cards, along with 112 Texture Units. A total of 32 ROPs take care of the last stage of 3D rendering. The memory subsystem remains the same as well, with 5.5Gbps memory running over a 256-bit bus. Asus has stuck with the reference version's total of 2GB of onboard memory, which leads to some performance quirks compared to 4GB versions, as you'll see in our performance summary.

The only difference between the R9 380 and its predecessor is a slight increase in the Boost Clock speed. In the R9 285 the top speed was 918MHz, which AMD has increased to 970MHz in the default R9 380, a meagre 6% jump. Asus has increased this to 990MHz at stock speed, which can be further increased to 1010MHz once the OC mode is engaged. That's a total of just 4% faster than the reference card, showing how tapped-out the Tonga GPU inside is.

Asus has decked its variant of the R9 380 out with its DirectCU II cooler, which we've seen in the past on other products. This uses a similar heatpipe design employed on other coolers, and is more than powerful enough to handle the card's 190 TDP. Speaking of power, Asus went to lengths to highlight the additional power phases that it has installed on this card. Where the reference design opts for a 4+1 phase power system, Asus has decked out this product with a 6+2 phase system, which is fed via a single 8-pin power connector. In theory this should lead to a cleaner, more stable

power supply. This could explain why we were able to overclock our card to a maximum boost speed of 1100MHz, which is rather surprising given that it's already an overclocked R9 285.

Asus also promotes this product as having "Auto-Extreme" technology. This is a family of different technologies that are claimed to combine to deliver a better overclocking experience and longer product lifespan. Firstly, this card is built entirely by an automated assembly line, the first of its kind in the world. It's also apparently built using aerospace quality components, a line we've heard from other manufacturers such as Galax's HOF range. All soldering flux has been removed, which removes any dust from the PCB and accompanying connectors. Finally, it uses "Super Alloy Power Components", which alludes to better than standard-quality components, which apparently translates into a longer lifespan. This could explain why this product is relatively expensive when compared to other 2GB R9 380 cards, which start at \$289 for MSI's base level product. This card carries the exact same outputs as seen on the R7 370 in this roundup, with one DVI-I, one DVI-D, one HDMI 1.4a and one DisplayPort 1.2 output.

When compared to Nvidia's GTX 960, the R9 380 offers better bang for buck. However, when measured against a 4GB version of the R9 380, we can see a substantial performance drop in the Shadow of Mordor test, with the 4GB MSI card being a whopping 30% faster. Given that the MSI card only costs 6% more, we have to give the nod to MSI's card over the Asus, especially as it overclocks by a similar margin.

KEY SPECS

\$329 • www.asus.com.au

GCN 1.2 • 2GB DDR5 onboard memory • Twin Frozr 5 cooler • 1x DVI-I, 1x DVI-D, 1x HDMI 1.4a, 1x DisplayPort 1.2

OVERALL





PowerColor PCS+ R9 390

MOST OF THE POWER OF A 390X
AT A FRACTION OF THE COST

In the midst of so many mediocre reviews, it's nice to be able to tell a story that isn't so glum. This product from value-oriented PowerColor finally delivers the AMD experience we're so used to – good performance at a great price. Offering much of the power of an R9 390X but with a hugely slashed price, this is a solid piece of kit.

At the heart of the R9 390 is the same Hawaii GPU used in the R9 290. Once again we see AMD rolling out an identical piece of silicon compared to its predecessor, with the same 2560 Stream Processors, 160 Texture Units and 64 ROPs between the two parts. A rather minor frequency increase gives the 390 a boost frequency of 1000MHz, up from the 947MHz of the 290. PowerColor has seen fit to increase this by, wait for it, one whole percent. Yup, it now runs at 1010MHz, and again we have to wonder why they even bothered, other than to edge out reference cards in benchmark results. We managed to boost this to a maximum of 1130MHz, one of the better

overclocks in the new range of products, likely as a result of the lower TDP of this product. As such, expect a healthy 10% boost over our stock benchmark results. AMD's reference R9 390 has a TDP of 250W, but PowerColor doesn't list its product's TDP on their site. However, the need for a 750W power supply hints that this is a power hungry product, and it's fed via a single six-pin power connector alongside another eight-pin connector.

Unlike the R9 390X, which has experienced a 20% performance boost to its memory over the R9 290X, the R9 390's memory subsystem is identical to the R9 290. The same 512-bit bus feeds 5Gbps memory, but there has been one substantial change this time around. Once again AMD has doubled the onboard memory capacity up to a huge 8GB, from 4GB on the original 290. That's a bucket-load of memory for a sub-\$500 card.

PowerColor has decked its version of the 390 out with a huge triple fan cooler, which it calls the Professional Cooling System, or PCS. When combined with the PCB, the card is an absolute giant, stretching for a lengthy 305mm, with a chunky 55mm depth and standard 130mm height. Owners of small cases will want to check this beast can squeeze inside. PowerColor has added a metal backplate to the card, likely as a support so that this behemoth doesn't bend or warp. Unfortunately this large cooler doesn't seem to do a very quiet job. We measured a rather loud 55dB of fan noise during Shadow of Mordor, making this one of the noisiest cards in

the roundup. Considering Sapphire was able to deliver the hotter 390X at 51dB, it's obvious that the PCS cooler needs some attention.

Along with the loud fan noise, we're rather disappointed by the range of outputs on this card, as PowerColor seems to have adopted a very budget-oriented approach. There's a single HDMI 1.4a alongside a single DisplayPort 1.2, along with one each of the DVI-D and DVI-I outputs. On the flipside, this has probably helped keep the price so reasonably low, which makes this card so notable.

At a mere \$489, this card is priced against the likes the MSI GTX 970, which retails for \$495. We benchmarked it against the Galax GTX 970 HOF, which has a factory overclock of around 15% and costs \$100 more than the PowerColor R9 390. Even with this overclock, the R9 390 managed to beat the 970, starting with a very slight lead in 3DMark FireStrike. Unfortunately Grid AutoSport saw the 390 being beat by 15% by the 970, but the lead shifted back to the 390 in Shadow of Mordor, where it had a small 3% lead.

Once the R9 390 is overclocked, it shows strong performance against Nvidia's GTX 970, beating it in most tests. As a result, we're giving this card the thumbs up for buyers with \$500 to spare, value the 8GB memory and don't need cutting edge outputs.

KEY SPECS

\$489 • www.powercolor.com

GCN 1.1 • 8GB onboard GDDR5 • 1 x HDMI 1.4a,
1 x DisplayPort 1.2, 1 x DVI-I, 1 x DVI-D

OVERALL





Sapphire Tri-X R9 390X

THE FLAGSHIP FAILS TO IMPRESS

Welcome to the flagship in AMD's new 300 series, which shouldn't be confused with the flagship of its new Fury range. The R9 390X is priced at a premium of almost \$700, and is being pitched by AMD as a 4K-ready card. Considering twin GTX 980 Ti cards struggle to maintain 60fps at 4K resolution, we find this claim to be rather laughable, but AMD isn't the only one who claims certain single-GPU solutions are 4K ready. Now that we've put your expectations back in place, let's take a look to see what makes the R9 390X tick – thankfully it's not just another stock standard rebrand.

The GPU at the heart of this product is the Hawaii chip that launched back in late 2013 as the R9 290 and 290X. As such it shares many similarities with its predecessor, starting with an identical Stream Processor count of 2816. It also has the same number of Texture Units, at 176, and the 64 ROPs is identical to its predecessor.

Interestingly, the new Fury X has the same number of ROPs, which could be why it's not quite the GTX 980 Ti beater it was pitched to be. It's a GCN 1.1 part, which means all of AMD's proprietary technologies are supported on this card.

As seen on the other cards, AMD has endowed it with a slight bump in boost frequency, rising from the 290X's 1000MHz to 1050MHz, a straight 5% increase. Sapphire has rather hilariously increased this to 1055MHz – a 0.5MHz increase! We have to question why they even bothered...

Where the R9 390X improves over its predecessor is the memory. While the same 512-bit memory bus is employed, AMD has increased the memory speed to 6Gbps, up from the 5Gbps of the original. This 20% increase should enable better performance at higher resolutions/antialiasing settings. AMD has also seen fit to roll out a whopping 8GB of onboard memory on this product, further ammunition for claims that this is a 4K-ready product. Strange, as it's also claiming the Fury X is 4K-ready, and that only has 4GB of memory. AMD has really worked itself into a marketing black hole on that issue.

The original R9 290X was a bit of a steamer, so it's no surprise to see that the new card has a rather high TDP of 275W. Well, that's what AMD's reference numbers claim – Sapphire's specs increase this to a massive 375W, which is insanely high. Thankfully that won't change due to Sapphire's rather tiny overclock. We managed to extract another 90MHz out of the core, increasing the boost speed to 1045MHz. This is likely thanks to the whopping huge

cooler Sapphire has strapped to this beast. The Tri-X cooler uses three fans to remove the heat from heat pipes employed below. Unfortunately it's a rather loud critter though, pumping out 51dB of fan noise during our Shadow of Mordor test. It's no surprise though, given how much heat it has to remove.

As far as outputs go, this R9 390X is a step up from the other cards. One DVI-I sits alongside another HDMI 1.4a, while three DisplayPort 1.2 outputs round out the selection. Twin 8-pin power connectors deliver the necessary voltage to power the GPU.

With a price tag of almost \$700, this card sits firmly in GTX 980 territory, with cards such as Gigabyte's GTX 980 Windforce retailing for just \$714. As a result we benchmarked the R9 390X against the only GTX 980 we had on hand, the Asus GTX 980 Gold Edition. We should point out that this is around 5% to 10% faster than the Gigabyte GTX 980, but even with this margin removed it absolutely creams the R9 390X. It has a 20% lead in FireStrike, with another 20% lead in Grid AutoSport. Shadow of Mordor saw the lead of the GTX 980 close to just 7%, but at the end of the day the R9 390X just can't keep up. Not only is it slower than a GTX 980, it also runs a damn sight hotter, which results in a much louder fan. Throw in the lack of Nvidia features such as PhysX which are actually used by several games, as well as the lack of HDMI 2.0, and the R9 390X simply doesn't deserve your attention.

KEY SPECS

\$689 • www.sapphiretech.com
GCN 1.1 • 8GB onboard memory • 1 x DVI-I,
1 x HDMI 1.4a, 3 x DisplayPort 1.2

OVERALL

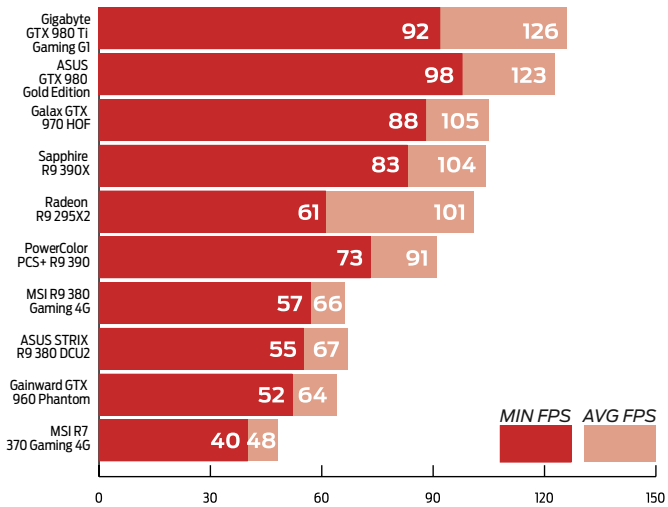




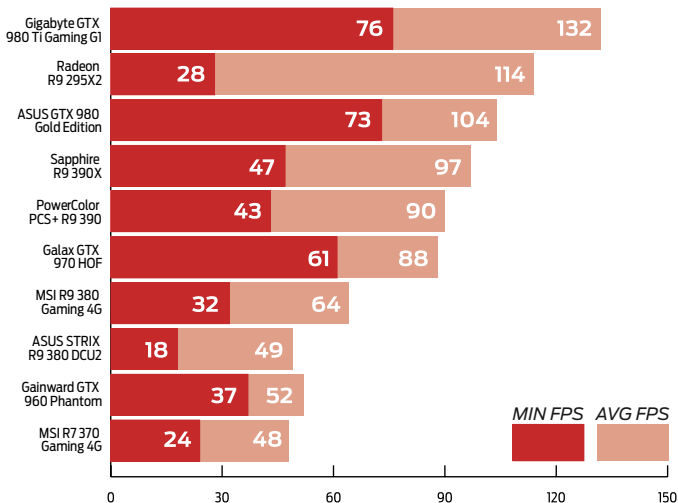
Conclusion

As each review shows, AMD's new range of rebadged goodies doesn't have what it takes to bring Nvidia down. The combination of aging architecture and average performance means buyers are now better off in the Green Corner when buying to a low budget, which is a big shift from the past. It's only the value-oriented PowerColor R9 390 that delivers stiff competition to Nvidia's GTX 970.

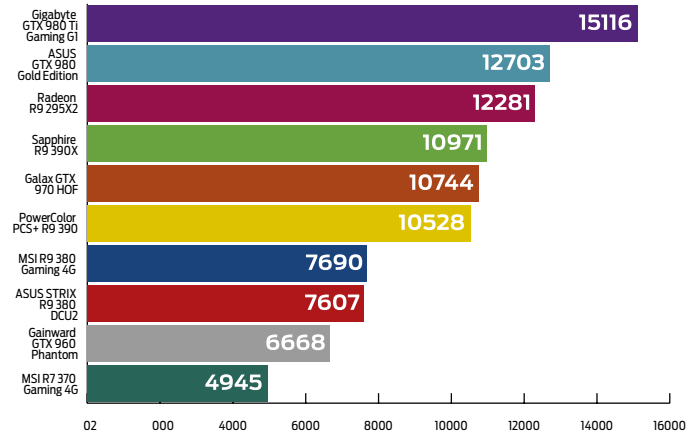
GRID AUTOSPORT 2560 X 1440, 4XMSAA, ULTRA DETAIL



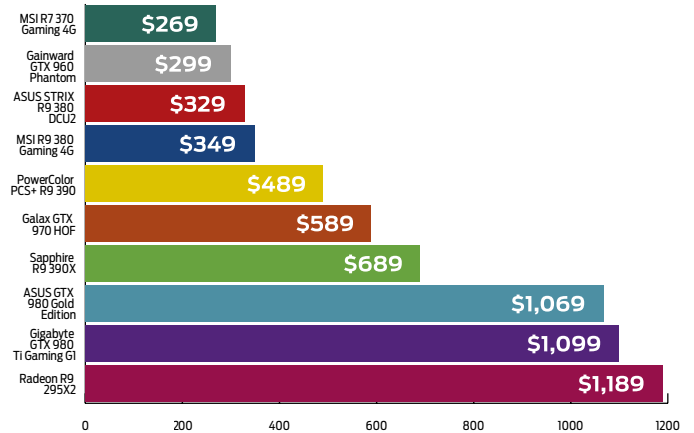
SHADOW OF MORDOR 1920 X 1080, ULTRA DETAIL



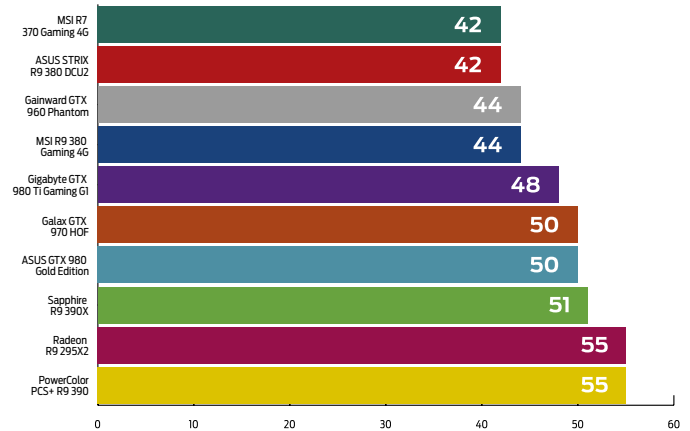
3DMARK FIRESTRIKE



PRICE \$



SHADOW OF MORDOR FAN NOISE (DB)







Laptops of desire

FROM THE SLEEK LENOVO X1 CARBON TO THE POWERFUL APPLE MACBOOK PRO, THE LAPTOPS HERE OFFER THE ULTIMATE IN DESIGN AND DESIRABILITY

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The luxurious laptops in this month's Labs are the finest portables money can buy. All are stylish and capable – but within this elite group there's a variety of processors, storage options, display technologies and other variables. Here's our guide to what gives each of these laptops its unique character, and how to decide which will work best for you.

PROCESSORS AND GRAPHICS

Five of the six laptops on test stick with Intel's tried-and-tested Core i5 and i7 processors. One, however, opts for Intel's low-power Core M design. It's intended specifically for ultrathin devices, and no laptop comes thinner than Apple's 12in MacBook.

Built on a 14nm process, the tiny Core M is designed to run cool, removing the need for

an internal fan. That means the MacBook is the only laptop here that runs silent, no matter how hard it's being pushed. However, it also means Intel has had to rein back the clock speed to prevent tablets and laptops from overheating. The Core M-5Y31 inside the MacBook is nominally a 900MHz part, and how long has it been since we talked about laptop processors in terms of megahertz, rather than gigahertz?

To speed things up, Apple has boosted the processor's core clock speed to 1.1GHz, but that still leaves it lagging behind the Core i5 processors, as is reflected in our benchmarks. And achieving that higher speed has meant raising the processor's TDP from 4.5W to 5W. While we suspect the impact on battery life is slight, the MacBook does have the joint

		LABS WINNER	RECOMMENDED	
	Apple MacBook	Apple MacBook Pro with Retina display (13in)	Dell XPS 13	
OVERALL	★★★★☆	★★★★★	★★★★☆	
PURCHASE INFORMATION				
Price	\$1799	\$1799	\$1899	
Website	apple.com/au	apple.com/au	dell.com.au	
Dimensions (WDH, including feet)	281 x 197 x 13mm	314 x 219 x 18mm	304 x 200 x 15mm	
Weight (with charger)	0.92kg (1.1kg)	1.58kg (1.82kg)	1.18kg (1.46kg)	
SERVICE & SUPPORT				
Warranty	1yr	1yr	1yr	
CORE COMPONENTS (AS REVIEWED)				
Processor	1.1GHz Intel Core M-5Y31	2.7GHz Intel Core i5-5257U	2.2GHz Intel Core i5-5200U	
RAM fitted	8GB	8GB	8GB	
DISPLAY				
Size & finish	12in gloss	13.3in gloss	13.3in matte	
Resolution	2,304 x 1,440	2,560 x 1,600	1,920 x 1,080	
Touchscreen (type)	✗	✗	✗	
Graphics chipset	Intel HD Graphics 5300	Intel Iris Graphics 6100	Intel HD Graphics 5500	
Video outputs	via USB Type-C adapter (not included)	HDMI; mini-DisplayPort	mini-DisplayPort	
DRIVES				
Storage capacity (as reviewed)	256GB	128GB	256GB	
Storage type	SSD	SSD	SSD	
Optical drive	✗	✗	✗	
BATTERY				
Battery type (capacity)	Lithium-polymer (39.7Wh)	Lithium-polymer (74.9Wh)	Lithium-ion (52Wh)	
PORTS & CONNECTIONS				
Wireless connectivity	802.11ac; Bluetooth 4	802.11ac; Bluetooth 4	802.11ac; Bluetooth 4	
Wired Ethernet speed (Mbps/sec)	N/A	N/A	N/A	
Memory card reader	✗	SD/SDHC/SDXC	SD/SDHC/SDXC	
Ports	3.5mm headphone jack; USB Type-C	3.5mm headphone jack; 2 x Thunderbolt 2; 2 x USB 3	3.5mm headphone jack; 2 x USB 3	
OTHER FEATURES				
Webcam	480p	720p	720p	
Backlit keyboard	✓	✓	✓	
Touchpad toggle on/off	✗	✗	✗	
Volume control	✗	✗	✗	



worst score in our battery-life tests. Even though Apple has sliced its batteries into thin layers to ensure that every cubic centimetre of space inside that tiny shell is filled with power, the MacBook will still require a charge before the end of the day if it's pushed even moderately hard – more on this later.

Although the rest of our laptops all

use Core i5 and i7 processors, they don't all hail from the same generation. The Core i5-4300U inside the Surface Pro 3 is from the 22nm Haswell generation, launched in 2013, and uses the older HD Graphics 4400. The rest of the laptops use the more modern 14nm Broadwell architecture and the latest HD Graphics – with the exception of the MacBook Pro, which features the superior Iris 6100 graphics processor. That enhanced chipset is one of the main reasons why the MacBook Pro surges ahead of the Windows pack in our benchmark tests. Where the HD Graphics 5500 offers 24 execution units, capable of 364.8 GFLOPS, the Iris Graphics 6100 has double the number of execution units, running at slightly higher frequency and

delivering 844.8 GFLOPS.

DISPLAYS

One of the reasons Apple has chosen the Iris processor for the MacBook Pro is that it has to push around more pixels than any other laptop in the group. The 2,560 x 1,600 resolution of the MacBook Pro's screen equates to 227ppi – a pixel density that only its 12in MacBook sibling matches. (The fact that the MacBook has to use less powerful HD Graphics 5300 to drive such a high-resolution display is another reason it does so poorly in our benchmarks.)

There's simply no doubt that OS X handles these ultra-high-resolution displays better than Windows. Everything on one of Apple's Retina displays is

	Lenovo ThinkPad X1 Carbon	Microsoft Surface Pro 3
	★★★★☆	★★★☆☆
	\$2899	\$1399
	lenovo.com/au	microsoftstore.com
	331 x 227 x 19mm	292 x 201 x 9mm
	1.31kg (1.67kg)	0.8kg (0.97kg)
	3yr	1yr
	2.6GHz Intel Core-i7 5600U	1.9GHz Intel Core i5-4300U
	8GB	4GB
	14in gloss	12in gloss
	2,560 x 1,440	2,160 x 1,440
	✓ (10-point)	✓ (10-point)
	Intel HD Graphics 5500	Intel HD Graphics 4400
	HDMI; mini-DisplayPort	mini-DisplayPort
	256GB	128GB
	SSD	SSD
	✗	✗
	Lithium-polymer (50Wh)	Lithium-ion (42Wh)
	802.11ac; Bluetooth 4	802.11n; Bluetooth 4
	(10/100 adapter in box)	N/A
	✗	SD/SDHC/SDXC
	3.5mm headphone jack; Ethernet adapter port; 2 x USB 3	3.5mm headphone jack; USB 3
	720p	1080p (front and rear)
	✓	✓
	✗	✗
	✗	✓



HOW WE TEST

All six of the laptops in this month's Labs are put through a comprehensive series of tests. Our new benchmark suite measures the performance of each laptop across three different types of workload: image editing, video editing and multitasking. These push the laptops' CPU and memory to full utilisation for sustained periods of time, ensuring you get a true reflection of the capabilities of these machines.

The laptops are scored against our reference machine – a desktop PC with an Intel Core i5-4670K CPU, 8GB of RAM and an AMD Radeon R7 260X graphics card, which gets a score of 100. So a laptop with a score of 50 is half as fast as our reference PC. The two Macs were benchmarked using Windows 8.1 on a Boot Camp partition.

We also test the quality of the display, using an X-Rite i1Display 2 colorimeter. We measure the maximum brightness, contrast ratio and colour accuracy of each screen, as well as drawing on our own impressions of the screen quality.

Finally, we measure the battery life of each of the laptops. We do this by setting the brightness of the screen to 120cd/m2 (measured using the colorimeter) and playing a 720p video on loop using the laptop's default video application. All wireless connections are switched off while the test is running. Our battery-life scores thus provide a realistic best-case scenario.

perfectly scaled for the screen size, so that menu text never becomes unreadable or blurry. Although Windows' handling of high-resolution screens has improved, it's still far from perfect. With default settings, the text in Explorer windows on the 2,160 x 1,440 Surface Pro 3, or the 2,560 x 1,440 Lenovo ThinkPad X1 Carbon, is tiny, almost forcing us to squint at the screen. Open a PowerShell window on either device if you want a real eye test: it's worse than the bottom row of an optician's chart. There are workarounds, but you shouldn't have to rely on them.

It's also interesting to see how laptop manufacturers still regard touchscreens as an optional extra rather than a must-have, even at this upper end of

the market. Apple is famously averse to the idea of bringing touch controls to OS X, while the Dell XPS 13 and ThinkPad X1 Carbon offer touch only as an optional extra. Intel's Ultrabook specification stipulates that laptops must have touchscreens, so evidently laptop manufacturers have a lesser regard for that branding than they might have had a few years ago.

We still believe that a laptop intended to run Windows 8.1 – or soon Windows 10 – is generally enhanced by a touchscreen, not least because many of the apps (particularly games) in the Windows Store are designed for touch controls. But touch does have downsides. The touchscreen layer on the ThinkPad's 14in screen, for example, creates a

visible mottling effect, which softens the appearance of its MacBook-rivalling resolution.

PORTS AND CONNECTIONS

Another major point of differentiation between these laptops is the number of



ports and connections they offer. At the minimalist end of the scale, the MacBook has only one port: the new, reversible USB Type-C connector that's used for everything from charging the laptop to connecting external displays and storage. With only a single port, you're going to need adapters to do more than one of these tasks simultaneously, which for us crosses the tipping point of form over function. The one notable advantage of

USB Type-C on a laptop is compatibility with portable power supplies, which could help the MacBook keep going for the duration of a transatlantic flight, for example.

The Surface Pro 3, meanwhile, betrays the fact it's a tablet by providing only a mini-DisplayPort and a single USB 3 socket, in addition to its power connector – and even that single port is incapable of powering some external hard drives.

The conventional laptops offer more ports, none more so than the MacBook Pro, which offers two different types of display output, two Thunderbolt 2 and two USB 3 ports.

Ethernet ports have been expunged from all of our laptops, but for those who need the stability of a wired connection, the ThinkPad comes with an adapter in the box. You'll have to buy USB adapters separately for the rest.

HAS THE ULTRABOOK HAD ITS DAY?

INTEL'S ULTRABOOK INITIATIVE SAW MOBILE COMPUTERS BECOME THINNER AND LIGHTER – BUT OTHER FIRMS ARE NOW OFFERING THE SAME FOR LESS MONEY. SO WHAT'S NEXT?

When Intel unveiled the Ultrabook concept in 2011, Windows laptop design was in a sorry state. The original MacBook Air had been launched three years previously, but PC manufacturers were still struggling to deliver an ultraportable with even a fraction of its desirability.

So Intel decided that something had to be done. Through Intel Capital, its investment arm, it launched a US\$300 million fund to promote the creation of a new, sleeker generation of laptops. "The Ultrabook Fund will focus on investing in companies building technologies that will help revolutionise the computing experience and morph today's mobile computers into the next must-have device," said Arvind Sodhani, president of Intel Capital, at the time.

Intel also teamed up with leading PC manufacturers to create the Ultrabook specification. Only laptops less than 21mm thick (or 18mm for 13.3in screens), with a battery life in excess of five hours, would qualify. Oh, and they needed to use Intel Core processors, of course. Machines that met the criteria would use the Ultrabook logo and benefit from Intel's marketing push, rewarding the manufacturers for their efforts.

The initiative has had an undeniable effect over the past four years. Although the MacBook Pro is this month's Labs winner, its Windows rivals no longer look like ugly ducklings. Hide the Dell logo on the XPS 13 and you might even fool people into thinking it's a MacBook. Industry watchers agree that the initiative has given the market a shot in the arm: "Intel played a very important role in making the redesign of the laptop happen, and the eventual revival of PC sales," Maciej Gornicki, research manager at IDC, told us.

Yet here's the odd thing. The Dell XPS 13 doesn't bear the Ultrabook logo. In fact, only two of our six devices this month come

with that once-cherished sticker. What's happened to the Ultrabook name? Does it still mean anything?

TODAY'S ULTRABOOK SPEC

Since its launch, the Ultrabook specification has been through two major revisions, most recently in 2013. Today, an Ultrabook must be 20mm or thinner if its display is smaller than 14in, or less than 23mm thick if it has a bigger screen.

More interestingly, that display must also be a touchscreen, leading to a situation where some models within a laptop range are Ultrabooks and some aren't. For example, the Dell XPS 13 on test doesn't meet the criteria, but the touchscreen variant – which looks outwardly identical to the standard model – does.

Intel also uses the Ultrabook specification to push certain technologies, and not only its Core processors. All modern Ultrabooks must support the company's WiDi protocol, for example, which allows you to wirelessly beam video from your laptop to compatible television screens or projectors. If that's missing, there's no sticker for you.

WHERE NOW FOR ULTRABOOKS?

Four years on, the Ultrabook initiative has arguably done its job. "Although Ultrabooks initially were offered at very high price points (and a majority of them still are), their introduction led to an overhaul of the majority of portable PC designs in the market, irrespective of their tech specs," said IDC's Gornicki. "Even though an Ultrabook is quite pricey these days, many vendors offer less expensive models, with less power inside, which are still very light

and attractive for the average consumer to buy."

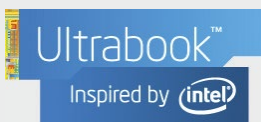
The analyst also claims that the Ultrabook sticker does little for sales. "I think that in the majority of cases, consumer's purchasing decisions are not influenced so much by whether a portable PC is actually branded an Ultrabook or not," he said. "There are more important factors such as price or performance that influence consumer behaviour."

Meanwhile, Intel has seemingly shifted its focus onto laptops that can be converted into tablets, such as the Microsoft Surface Pro 3, which carries the Ultrabook sticker.

"I'm not entirely sure where Intel will go with its Ultrabook campaign in the future," said Gornicki. "The company did a great job in transforming the industry to offer much thinner and lighter machines. But my impression is that for the past two years Intel has been focusing more on promoting two-in-one designs, which is yet another step on the road to transforming a laptop into a more attractive and useful product. It's already become slim; now it's time to bring more versatility, by offering a rotating or detachable touch-enabled screen."

On the schedule for the Intel Developer Forum held in Shenzhen in April, you'll see not a single session devoted to Ultrabooks – but there is one entitled "Design considerations and reference designs for value and mainstream two-in-ones". The accompanying presentation perhaps gives a clue as to why Intel has shifted its focus: "Two-in-one buyers refresh their PC approximately one year earlier than notebook buyers," it reveals.

With the overall PC market continuing to shrink, Intel is perhaps banking on convertible devices to give the market a fresh shot of adrenaline, just as the Ultrabook did four years ago.



< Intel's brand is no longer a must-have for a lightweight laptop



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BILLION[®]



Apple MacBook Pro 13in with Retina display

A NEAR-PERFECT BALANCE OF PORTABILITY AND POWER,
WITH A STUNNING SCREEN AND AN UPDATED TRACKPAD TO BOOT

The MacBook Pro is a familiar design: it hasn't received a significant makeover for a few generations, but it still strikes the right balance between practicality and poise. The 13in model is heavier than most laptops here, and that's compounded by a chunkier charger. But you get plenty for your money.

For a start, it's exceptionally comfortable to work on. A MacBook Pro on your lap feels like a deceptively expansive workspace; even at a desk, it

feels generous, rarely leaving us tempted to plug in an external screen.

That's partly down to the vast 2,560 x 1,600 resolution of the built-in panel – and OS X's clever graphics technology, which scales applications for a high-DPI screen considerably better than Windows. Another reason we're happy to forgo the external display is that you'll struggle to find one as sumptuous as the Pro's built-in panel. When you're sitting next to a bright window, the 400cd/m2 maximum brightness ensures details

are perfectly visible, even though it's more reflective than the screen on the Dell XPS 13. The 97.7% coverage of the sRGB colour gamut and near-flawless colour accuracy will delight filmmakers and photographers, and contrast is stark at 994:1. If there's a better laptop screen out there, we're yet to see it.

Looks aren't everything, of course, but the Pro isn't found wanting for connectivity or power either. With mini-DisplayPort (in the form of Thunderbolt) and full-sized HDMI outputs, you're not



- 1 The new Force Touch trackpad adds a new way to interact with the OS and applications
- 2 A generous set of ports ensures you can hook up to external storage and displays with ease
- 3 The MacBook Pro's design has barely changed in several years, but its simplicity still looks fresh



“Looks aren’t everything, but the MacBook Pro isn’t left wanting for either connectivity or power”

short of options for connecting external displays. The Intel Iris graphics can easily handle full native resolution – as well as two external displays running at up to 3,840 x 2,160, which is surely more pixels than anyone could need.

Two USB 3 connections and the aforementioned Thunderbolt 2 sockets also provide ample options for connecting high-speed external storage – which is just as well, since the base model comes with only 128GB of PCI Express-based flash. The step up to a 256GB model adds \$300 to the price, but is the least that you should consider if you plan to split the storage with a Windows Boot Camp partition.

Unlike the 12in MacBook (see p88), the Pro doesn’t offer the new Type-C USB connector, instead using Apple’s regular MagSafe connector to charge. That’s fine, not least because the connector has a handy indicator light on the top of it, letting you know the charger’s plugged in properly. An LED battery indicator like the Dell XPS 13’s would have been better, but with the MacBook Pro lasting 9hrs 40mins in our video-rundown test, you

won’t be concerned about running out of battery until pub time.

When it comes to processing power, the MacBook Pro is right up there with the best. Its overall benchmark score of 56 was head and shoulders above every other contender this month. The Core i5 processor and Iris GPU particularly told in the video-editing test, which the MacBook Pro completed in less than half the time it took the Core M-equipped MacBook.

The Pro is also a strong multitasker; its performance edge can be seen with the naked eye. Applications open just as quickly as OS X’s animations can carry them, 4K video footage plays without stutter, and you can keep a whole dock-full of apps running without unduly burdening the 8GB of RAM at your disposal.

That’s not to say the MacBook Pro is flawless. It split the office, but some of us prefer the bigger, shallower keys on the new MacBook’s keyboard to the well-spaced ones on the MacBook Pro. Music sounds slightly tinnier from the Pro’s speakers than it does from the MacBook’s, even though it has a larger

casing in which to house them.

But this is nitpicking. The 13in MacBook Pro is a fabulous laptop that puts its Windows rivals to shame. The touchpad controls alone make the competition seem clunky; you can glide smoothly through web pages and flick effortlessly between apps, and this will only improve when developers start taking advantage of the new Force Touch control, which can detect a hard press on the touchpad as distinct from a regular tap, adding a new dimension to the desktop.

Trying to make sense of Apple’s pricing is always a fool’s errand, but we’re baffled as to how the MacBook Pro can cost less than the 12in MacBook. It has a bigger display, better connectivity and far more power. The one thing the MacBook Pro lacks is a touchscreen – but there’s still simply nothing to touch it.

KEY SPECS

\$1799 • www.apple.com/au

OVERALL





^ Perfect for business trips, the MacBook is compact and lightweight. Connectivity is limited to a single USB Type-C connector

everything has to be plugged into the same single USB Type-C connector that's used to charge the laptop. Apple, of course, sees this as a design feature; we see it as a compromise too far. Without a hub or adapter to hand, you can't pop as much as a memory card into the laptop, and adding one makes things more awkward – and expensive. Apple wants \$119 for its USB-C Digital AV Multiport Adapter to drive an external screen, for example, although this also provides one additional standard USB socket in the adapter.

The MacBook lacks raw power too. While the 1.1GHz Core M processor and 8GB of memory keep OS X ticking over flawlessly, this isn't a laptop that's going to churn through a batch of raw images or scream through edits in Final Cut Pro. An overall score of 20 in our new benchmarks confirms the MacBook as the worst performer on test by a distance, and you won't be able to run demanding games at anywhere near native resolution – at least, not at acceptable frame rates.

That lack of grunt does have its upsides. You'll never hear a whirr or hum from the MacBook, because the chassis is entirely fanless, and even when you're pushing the MacBook it doesn't get unreasonably hot. It came joint bottom in our video-rundown battery test, lasting 7hrs 10mins, but this isn't at all bad or surprising considering the limited size of chassis. It might just get you through a transatlantic flight.

And that, ultimately, is what the MacBook is for: it's the finest executive toy ever invented. Arguably, it's even the most desirable laptop on test this month – but it's also the most impractical. If you need a laptop for web browsing and punching words onto a screen, the MacBook is simply magnificent. For more demanding work, its award-winning sibling is by far the better option.

Apple MacBook

A HUGE DESIRABLE DESIGN -BUT TOO MANY SHORTCOMINGS MEAN THIS ISN'T THE BEST OPTION EVEN FOR APPLE FANS

Apple ditched the suffixes when it launched the 12in MacBook – but if you want to trace its pedigree, it's a laptop that's much closer to the Air than the Pro, in terms of both performance and panache.

Without question, the MacBook is the laptop we'd want on a business trip. It's light, at 0.92kg, and perfectly proportioned. Most compact laptops are tough to type on, but the MacBook's backlit keyboard is a delight: well spaced, with just enough travel beneath the keys; our only gripe is the half-sized Enter key.

The trackpad is great, too. It's huge in comparison to the rest of the laptop, roughly the size of a compact smartphone, yet it responds to every glide of the finger with precision and doesn't get in the way. It's also

pressure-sensitive, allowing you to push down firmly to register a Force-click – a third option beyond the conventional left- and right-clicks. Right now, that delivers little more than Wikipedia definitions of words Force-clicked in Safari, but we can't wait for other applications to exploit this option.

The one regard in which the MacBook is more Pro than the Air is its screen. The 2,304 x 1,440 Retina display is astoundingly sharp, and both our eyes and measurements tell us it's among the best here. Its colour temperature of 6,683K is only slightly away from perfection, and with 93% of the sRGB

colour gamut

covered, it's plenty good enough for professional photo jobs. The black bezel running around the edge is conspicuous only next to the almost-edgeless Dell XPS.

What's much more noticeable is the MacBook's lack of ports:



> Keys are well spaced and the touchpad responds with precision

KEY SPECS

\$1799 • www.apple.com/au

OVERALL



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Dell XPS 13

A TRULY EXCEPTIONAL ULTRAPORTABLE, LET DOWN ONLY BY AN UNEVEN AND INCONSISTENT SCREEN

The Dell XPS 13 is the closest rival to the MacBook and MacBook Pro in this group. In fact, it's probably the closest Windows-based alternative to a MacBook there is. Although it shares the same nominal screen size as the MacBook Pro, it's almost a halfway house between the two Apple laptops in terms of both performance and size.

We have to applaud Dell's attention to detail in the design of the XPS 13. Its aluminium casing is virtually indistinguishable from the MacBook's,

giving this dinky laptop a reassuringly solid feel. Look more closely and thoughtful design touches can be found all over. On the left-hand flank there's a discreet five-LED battery indicator, allowing you to press a button and check how much juice remains without firing up the laptop. This is handy, since both of the Dell's USB 3 ports support PowerShare, allowing you to charge a smartphone or other USB device even when in standby. The power cord also has an LED indicator, providing

instant reassurance that it's plugged in properly, and the Dell uses one of the dinkiest power bricks we've ever seen – it's roughly the size of a deck of cards. The only thing we don't like about the exterior is a daft little flap on the underside, which hides the serial number and safety information. We snagged it on our trousers when using the XPS on our lap, and we can see it snapping off down the line.

Flip open the laptop and the design excellence continues inside. The



- 1 The touchpad is the best we've seen on Windows
- 2 At the sides, a "sandwich" design exposes all the important ports
- 3 Dell's aluminium casing is understated but elegant – and tough



palm rest is made from an attractive chequered carbon-fibre material that's pleasingly smooth to the touch. The trackpad is a decent size and super smooth in operation – the closest any of the Windows touchpads come to matching Apple's. And although the keyboard is a tad rattly for our liking, it's by no means a weak spot.

Then we come to the XPS 13's most divisive feature: its screen. With its ultra-thin bezel and matte finish, the display has an almost paper-like quality to it. It's offered in both Full HD, as reviewed here, and in a Quad HD+ 3,200 x 1,800 model. Even at the lower resolution it looks stunning.

Sadly, it's let down by two huge flaws. When we reviewed the ultra-high-resolution model earlier this year, the experience was marred by visible backlight bleed, and that's also apparent on this Full HD model, particularly in the bottom-left corner. Worse, Dell has deployed a dynamic-contrast system that boosts the screen's brightness when there's light content onscreen, and dials it back when the screen is dark. It's highly noticeable when you flick from a dark Windows Start screen to a Word document, as the display takes a second or two to adjust to peak brightness. Since you can't switch off this feature,

the XPS 13 is useless for anything colour-critical, as you simply have no control over the display. Now that the XPS 13 has been on sale for a few months, we'd hoped Dell would have offered a workaround, but no joy.

The XPS 13 doesn't disappoint when it comes to performance, however. Even though our review model is the second-

"With its ultra-thin bezel and matte finish, the display has an almost paper-like quality to it"

lowest spec that Dell offers, its 2.2GHz Intel Core i5-5200U and 8GB of RAM powered it to an overall benchmark score of 39, making it almost twice as fast as the 12in MacBook and a third faster than the Surface Pro. It still trails the MacBook Pro by a significant margin, but everything on this little laptop feels suitably snappy. The XPS 13 chewed through demanding Windows Store games such as Asphalt 8, and although the fans do kick in after a couple of minutes of 3D action, they never reach irritating noise levels.

If that fan noise does become a

distraction, you'll be able to drown it out with the surprisingly powerful speakers, which don't distort even with the volume cranked all the way to 100 (although music lacks almost any trace of bass). Battery life is exceptional, too: the XPS 13 lasted 10hrs 23mins in our video-rundown test, which is 43 minutes longer than the MacBook Pro.

Overall, the XPS 13 is one of the most alluring Windows ultraportables we've ever seen. It's a real shame that Dell's baffling decision to impose dynamic contrast rules it out as an option for photographers, or anyone who needs fine control over colours.

All the same, it's unlikely to ruin the laptop for most. The Dell XPS 13 dazzles you the first time you set eyes upon it, its size and weight – and the feel of holding it – make it easy to love. Only the marginally more expensive MacBook Pro stops the Dell XPS 13 running away with this month's Labs Winner award, and that's by no means damning with faint praise.

KEY SPECS

\$1899 · www.dell.com/au

OVERALL



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▲ The full-metal shell means this Carbon won't suffer the scuff marks of previous models

cushioned travel under each of the keys and a lovely big Enter key. Slap bang between the G, H and B keys you'll find the trademark Lenovo TrackPoint –but those who prefer the touchpad will find it flawless, with a delicate clunk to confirm that a click has been registered. While it's not as sizeable as the MacBook Pro's touchpad, there's not a great deal in it.

It's also less of an issue, because this high-end variant of the X1 comes with a Quad HD touchscreen. It works perfectly – flicking through the Start screen or a web page is beautifully smooth – but the touchscreen coating visibly mars the display; as with previous Carbons, the screen looks like it's been sprayed with a fine mist, almost as if you're looking through a sheet of cling film.

Colour is another issue. Photos don't look bad in isolation, but they're slightly duller than on either of the MacBooks. The maximum measured brightness of 304 cd/m2 is dim in comparison to Apple's displays, and colour accuracy was wayward, with an average Delta E of 2.98. For all those reasons, the X1 Carbon wouldn't be our choice for photography or video work.

The big issue with the X1 Carbon is its staggering price. Features such as 4G, a fingerprint reader and a three-year on-site warranty are significant add-ons that shouldn't be discounted, but when the MacBook Pro offers more power, a vastly better screen and longer battery life for around half the price, we can't endorse spending this much on the ThinkPad.

If you're prepared to sacrifice power, screen resolution and the touchscreen, you can buy the entry-level ThinkPad for \$1749 – but in comparison to our Labs winner, that model looks even less alluring.

KEY SPECS

\$2899 • www.lenovo.com/au

OVERALL



Lenovo ThinkPad X1 Carbon

DRIPPING WITH FEATURES THAT PROFESSIONALS WILL LOVE, BUT THE STEEP PRICE IS HARD TO JUSTIFY

The ThinkPad Carbon is this month's most businesslike laptop, offering enterprise-grade features that even Apple's "Pro"-branded laptop lacks. For one, it's the only laptop here with an integrated 4G adapter, so you won't be left scouting for a Wi-Fi hotspot or faffing with smartphone tethering.

Then there's the fingerprint reader, now tucked to the right of the keyboard rather than on the palm rest as on previous Carbons. Intel's vPro technology lets IT departments remotely secure a stolen laptop, and unlike Apple's highly nickable MacBook Pro, the X1 Carbon comes with a security lock slot, so you can bind it to your desk or a sales stand.

With a top-end Core i7 processor and 8GB of RAM to play with, we had high expectations of the X1 Carbon – but in our benchmarks it achieved results similar

to laptops with less premium CPUs. Evidently thermal throttling holds back the processor during sustained periods of peak load – so save yourself \$100 and don't bother with the upgrade from the Core i7-5500U to the i7-5600U.

It was a shame that the ThinkPad's battery ran dry almost two hours sooner than the MacBook Pro's in our video-rundown test – but it was no surprise since its battery is 50Wh, compared to the MacBook's 74.9Wh.

The laptop has a reassuring solidity, yet, despite boasting a bigger screen than the MacBook Pro, it's at least 100g lighter than both. The relatively lightweight power brick doesn't add undue bulk.

The rubberised lid of previous Carbons was easily scuffed, so we're glad to see a full-metal shell on this third-generation model.

There's little to fault on the inside. The keyboard is well spaced, with plenty of





^ AWith only a mini-DisplayPort and a single USB 3 port, the Surface Pro 3 suffers poor connectivity

Microsoft Surface Pro 3

BY FAR THE BEST SURFACE YET, BUT IT DOESN'T QUITE CUT IT AS THE LAPTOP REPLACEMENT MICROSOFT WANTS IT TO BE

Microsoft touts the Surface Pro 3 as "the tablet that can replace your laptop", but in terms of raw performance, it falls rather short. An overall benchmark score of 29 represents less than half the performance of the MacBook Pro, even though the two cost more or less the same – once you add the cost of the Type Cover keyboard to the \$1399 asking price.

That price gets you a 1.9GHz Intel Core i5 from the Haswell generation, and only 4GB of RAM, which explains why the Surface struggled in our multitasking benchmark. You can step all the way up to a Core i7 with 8GB of RAM and a 512GB SSD, but that will set you back a handsome \$2699.

The Surface Pro 3 is also light on ports: mini-DisplayPort is the only video output, and there's only one USB 3 port to play with. Note that this has

a maximum power output of 900mA, which wasn't enough juice for one of our USB 3 hard disks. At least there's a spare USB port on the charger for keeping a phone topped up.

Despite its limitations, the Surface Pro 3 is usable as a day-to-day laptop. Previous versions of the Surface have always worked better in tablet mode, but Microsoft has now refined the design considerably, with a kickstand that can be set to virtually any practical angle, to suit a lap or a desk.

The Type Cover – a \$180 "option", which we'd regard as mandatory – is also much improved. It doesn't flex as much as previous models, which helps you work with the device on your lap, and the Touchpad is bigger than on previous

models, too, although still tiny in comparison to that of the similarly sized MacBook.

Thankfully, you don't need to rely on the touchpad to scroll through pages and swipe through apps, because the Surface has a

splendid 12in touchscreen. It's not quite as high-resolution as the MacBook's, but when the two devices are placed side by side, it's impossible to spot a tangible difference in detail. Apple's displays also give a slightly warmer image, although here we're talking fine margins. The Surface Pro's measured average Delta E of 1.77 and 96.2% coverage of the sRGB colour gamut tell you there isn't much wrong at all with this display – although the maximum brightness of 325cd/m2 is down on both previous Surface Pros and the Labs-winning MacBook Pro.

In tablet mode, the Surface Pro 3 is heavier than the iPad Air, but at 800g it doesn't make your arms ache, and the supplied N-trig stylus delivers the most paper-like writing experience we've encountered on a tablet. For quick notes or sketches, it's sensational. Microsoft's still struggling to find a home for it, though: the stick-on fabric loop for the bottom of the Type Cover is easily knocked off in a bag.

The screen, meanwhile, feels natural in portrait mode, thanks to its 3:2 aspect ratio – a big improvement on the 16:9 of previous Surfaces. And the Surface Pro 3 is much kinder on the battery than its predecessors: set it down overnight and you won't come back to find the charge half gone. That said, it lasted only 7hrs 10mins in our video test, the joint worst score here.

Overall, the Surface Pro 3 is a huge improvement on previous models, but it falls just short of Microsoft's claim: as a laptop it has too many shortcomings for its price. All the same, if you're searching for a lightweight hybrid, it's one of the best we've seen.

KEY SPECS

\$1399 • www.microsoftstore.com

OVERALL



> The Type Cover is more solid than previous models, and the touchpad is bigger in flight mode



View from the Labs

ADVANCES IN BUILD QUALITY AND HIGHER SCREEN RESOLUTIONS ARE WELCOME, BUT SOME UPGRADES OFFER LITTLE TRUE BENEFIT, WARNS BARRY COLLINS

The first takeaway from this month's Labs is that, these days, if you have \$1400 or more to spend on a laptop then you're going to get a very decent machine indeed. There isn't a single device here, even the compromised Surface Pro 3, that we wouldn't be very happy to tuck in a laptop bag.

One thing that's notably improved in recent years is build quality. I remember spending upwards of \$2,000 on a laptop four or five years ago, only to see port flaps snap off, the casing crack and key tops start to rub off within a year of daily toil. We feel confident that none of the vastly superior laptops in this test would suffer a similar fate.

Unibody metal casing has become the

norm for premium laptops, a welcome trend for which we clearly have Apple to thank. And it hasn't come at the expense of added weight: the aluminium shells on these laptops are as light as – if not lighter than – their plastic ancestors.

“There isn't a single device featured in this test that we wouldn't be very happy to tuck into a laptop bag”

They'll withstand far more punishment too. We've seen a MacBook Pro dropped off the side of a desk, and while it may have ended up with an unsightly dent, that's far preferable to cracked plastic exposing the components inside. The days of seeing expensive laptops patched up with gaffer tape are coming to an end.

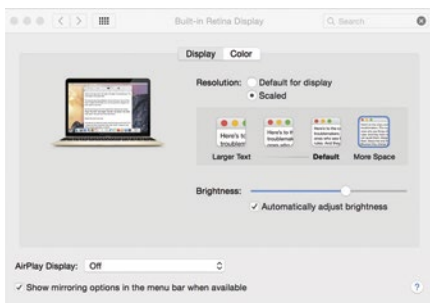
The other big advance has been in screen resolution. A 12in device with a 2,304 x 1,440 screen would have been utterly unthinkable just a few years ago – not only because screens were offering nowhere near 227ppi, but because the integrated graphics processors wouldn't have been able to cope with pushing



around that many pixels. So here we have Intel to thank as much as the display manufacturers.

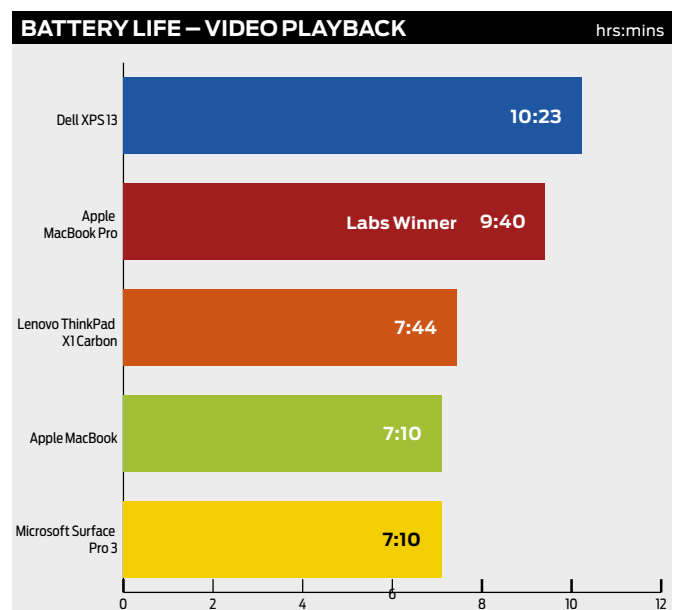
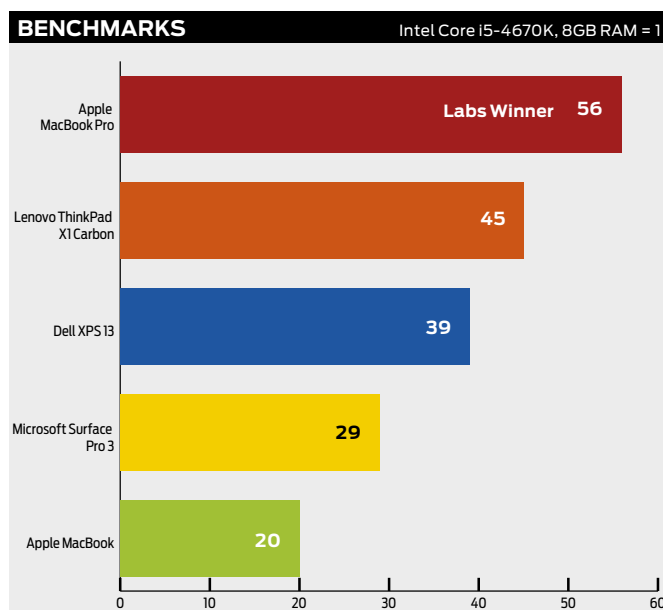
However, there's a sense of diminishing returns with these ultra-high-resolution screens. There's no denying that the displays on the MacBook and MacBook Pro look phenomenal, especially for watching 4K video. But one of the reasons the Dell XPS 13 offered twice the performance and three hours more battery life than the MacBook is because our review model was limited to a Full HD screen. Sure, it's not as sharp, but it still offers bags of detail. We'd take the improved performance and battery life over an expensive upgrade to the Quad HD version of the same laptop.

Indeed, our parting shot is to be wary of paying for the upgrades on offer with all of these machines, particularly CPU bumps. As we saw with the ThinkPad, spending \$100 on a slightly faster processor can end up making no real-world difference at all. Buy the spec that you need, not the one the manufacturers want you to. ●



▲ Although offering superb quality, will a Retina screen impact too heavily on battery life?

View from the Labs



Welcome to **Upgrade Australia**

Your monthly guide to essential PC upgrades and gear



MORE THAN A MAGAZINE

PC & Tech Authority is more than just a magazine and website. It's a collection of fine people with an interest in – or even love of – good tech. It's you, it's us, and it's the many people working for the companies that design and build the gear we like.

In March this year, we brought it all together. After six months of fascinating magazine features examining all aspects of our Upgrade Australia partner's tech, we held a major event showcasing real gear, and connecting you with the people that make it. Our stage show allowed a series of expert speakers to share with the audience what was hot, why it's hot and what's coming next. Afterwards, our display area was explored for hands-on time with the gear, all fuelled by (seemingly!) limitless food and drinks. And we're doing it again.



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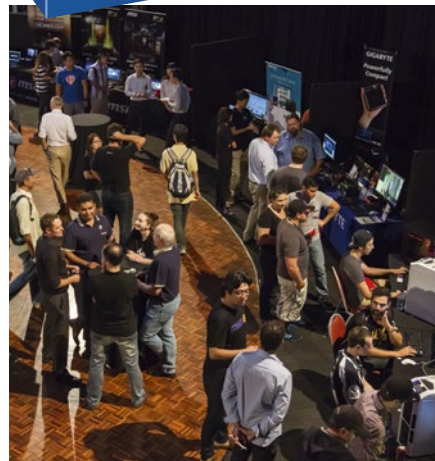
MORE THAN AN EVENT

Upgrade Australia starts here and now. For each of the next six issues we will bring you a look at a particular part of the tech scene, focussing on each of our Upgrade Australia partners and gear.

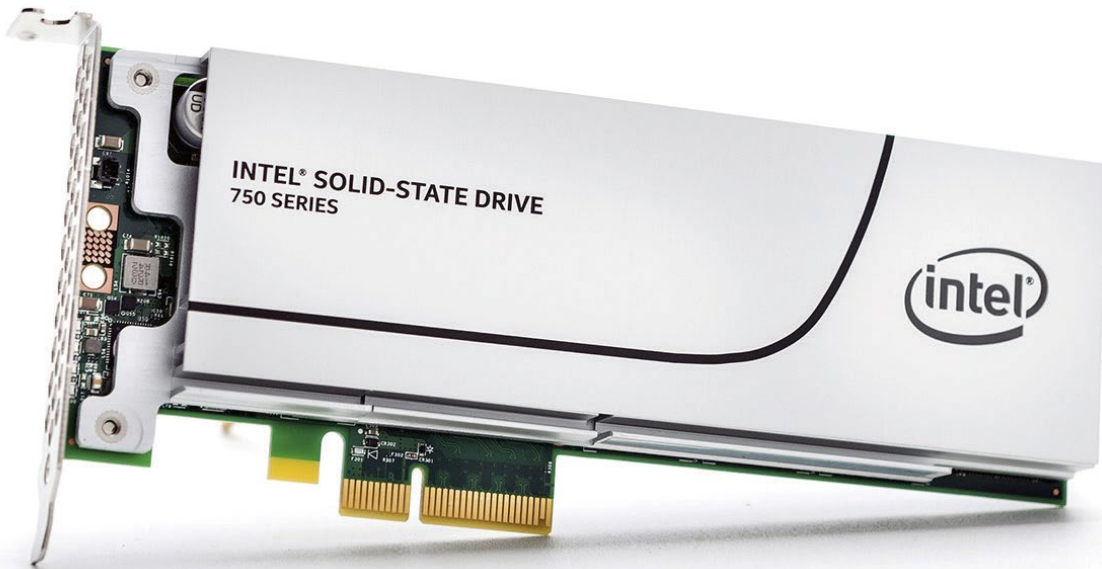
There's much more to come. Like a very cool competition with an incredible upgrade kit your PC will love. The details will be announced at the event.

A BIG YEAR FOR UPGRADES

The second half of this year promises to be an exciting one, with Upgrade Australia focusing on the latest in tech and gear, including Intel CPUs, Microsoft Windows 10 and more. Later we will look at the new 100-series motherboards as part of our expanded coverage throughout PC & Tech Authority. This month, we're taking a good look at Intel's very new and very exciting 750 SSD. Last issue we did a full review and were so impressed it went straight to the Perfect PC in our kitlog section.



upgrade
AUSTRALIA 2.0



THE FUTURE OF STORAGE, TODAY

INTEL 750 SERIES SSD

A spotlight on the unprecedented consumer speed of the Intel 750 Series SSD, and how you can take advantage of an incredible speed boost

While the Serial AT Attachment (SATA) interface continues to deliver extremely fast read and write speeds for a standard SSD, those seeking the next level of extreme performance now have a very appealing option.

There are several new storage standards available, but delving into those can be confusing, and there's really no need to explore those alternatives when the fastest technology is already here.

INTRODUCING NVME

The Intel 750 Series is the first solid-state drive (SSD) specifically built for consumers that takes advantage of the brand-new Non-Volatile Memory Express (NVMe) technology. Compared to SATA, NVMe has impressive performance improvements. Random and sequential read/write speeds are significantly improved, latency is reduced, and storage parallelism is boosted. On top of this, a drastic upgrade to the command queue, compared to SATA's Advanced Host Controller Interface (AHCI) standard, provides a huge increase in Input Output Operations Per Second (IOPS).

In terms of the actual numbers, an Intel 750 Series SSD offers up to four times the sequential read performance compared to the already speedy Intel 730 series SATA SSD. In practical terms, every task from booting an operating system, multitasking

and gaming, through to resource-intensive 4K video-editing is made faster on a 750 Series drive.

MULTIPLE FORM FACTORS

There are two form factors available for the Intel 750 Series SSD, and both offer two capacities. The first option is a half-height, half-length (HHHL) PCIe 3.0 Add-in Card, available in 400GB or 1.2TB sizes. With a 400GB Intel 750 SSD, there's enough storage space for everyday use as a primary drive, while the 1.2TB option makes working with larger files a cinch.

The Add-in Card is a great upgrade option for a desktop that has the space for it, and there's also a 2.5-inch U.2 form factor. This solution is also handy for when a PCIe 3.0 slot isn't easily accessible, such as when multi-GPU systems restrict access to slots, or for smaller cases where internal real estate is a premium. It can also attach to M.2 slots using an adaptor or hyperkit.

BUILT TO LAST

The Intel 750 Series has a life expectancy of 1.2 million hours Mean Time Between Failures (MTBF) and ships with a five-year warranty. On top of this, there's full power-loss protection on the 750 Series, meaning data stored in the cache at the time of power loss will still be restored upon restart.

"This is easily the fastest consumer drive we have tested, and by a large margin."

PC & Tech Authority August 2015

The 750 SSDs operate at as little as 4W while idle, and up to 22W during active read/write processes for the 1.2TB options, across form factors.

Inbuilt self-monitoring, analysis and reporting technology (SMART) tracks the health of the 750 SSD, while Intel Solid-State Drive Toolbox (intel.com/ssdtoolbox) and Intel Data Migration Software (intel.com/ssdinstallation) are available for free download to further monitor the drive and easily transfer data from an older drive.

The Intel 750 Series SSD is a speedy and versatile consumer-grade storage solution that offers outstanding performance gains that will be valued by those demanding the best, which includes workstation users, especially CAD/CAM users, engineers, simulation specialists as well as HD video editors and of course hardcore gamers!

To find out where to buy the Intel 750 Series SSD visit:
www.intel.com.au/findareseller



World of Warships open beta

THE ACTION IS SLOWER, BUT THE OUTCOME OF THESE NAVAL CLASHES IS ALWAYS GRIPPING

Wargaming is on the edge of officially releasing the final part of its free to play empire, World of Warships. But before that, the game's now in open beta phase, where anyone can download and sign up for the game. For a free to play title, it may seem, like a soft release, but there's a few differences to the game we're loving now (more on that in a bit), and the final release. The big one is that, when the game goes officially live, chances are all your current ships and XP will be erased. You may get a Premium ship for time served (Closed beta testers did), but everyone will be reset back to starter ships. Also, for now, there's only two complete technology trees to research – American and Japanese. Finally, the game is undergoing final balancing.

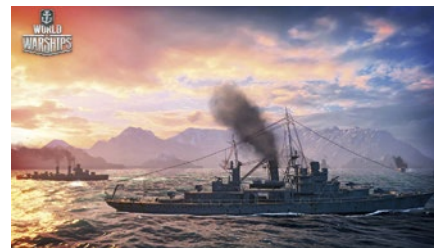
Oddly, you can, even in the beta, invest real cash-dollars into the game. No doubt, Wargaming is balancing even that in the lead up to release, but I know I'd be loath to invest in the game at this point. However, when the beta ends and the

game releases... that's another story.

If you've played any of Wargaming's recent titles, you know the basic recipe. Two teams of various classes of warship face off against each other across various maps, fighting to capture one or more victory points. Like in Tanks (let's ignore the poorly received Warplanes for now), combat is relatively detailed, but not overwhelming. All a ship's main guns fire at a single target, while secondary and anti-aircraft weapons automatically fire at targets when in range. Critical hits can take out your steering, destroy individual weapons, or cause flooding or start fires. Smaller destroyers and some cruisers also sport torpedos, which are much slower and easier to avoid, but which can cause massive damage to the enemy.

And there are also massive battleships with heavy armour and guns, and ponderous aircraft carriers that can launch squadrons of fighters, bombers, and torpedo planes into the air.

There's a distinctly rock-scissor-paper feel to the game, though there's always room to operate outside of that paradigm. Any combination of vessels, with sufficient teamwork, can take down any other combination, and some of the best moments in the game come from unexpected match-ups and last minute attacks; there's something really lovely about judging exactly where a suspected



but undetected enemy will be, launching torpedos, and then 20 seconds later being rewarded with a confirmed kill.

Warships is also very adept at keeping you playing, even once you start hitting the middle tiers of ship classes, where future vessels get ever more expensive. The range of individual unlocks on each single ship aren't that interesting, and there's not a lot of variety. In World of Tanks, you often have some interesting choices about what kind of gun to mount, but it's usually a forgone conclusion in Warships. That said, there's also camouflage you can apply to ships, and more detailed components that can simply be bought outright, which might apply bonuses such as decreased repair times or faster turret traverse.

All of this comes together in what could be Wargaming's best title yet. Each game is a little slower, as befits the naval behemoths battling it out, but that only makes the tension of each game that much more palpable; destroyers dart out early, while aircraft seek out enemy carriers overhead. Cruisers duel with enemy battleships, while trying to stop those pesky destroyers breaking through to wreak unwelcome havoc among the slower, heavier ships.

It's a game of careful maneuver and sudden, ferocious firefights across miles of ocean, with only a few scatter islands to break up the opposing fleets – there's even one map which is entirely open sea, making for a tense game of cat and mouse, as each fleet tries to find the other while hiding the axis of its own attacks.

If you're at all into naval combat and history, World of Warships is almost a must-play. The sheer detail in the ship designs, the way the classes all work together, even the manner in which tactics are evolving among the community... it all adds up to a remarkably premium gaming experience. And for free!

David Hollingworth

KEY SPECS

www.worldofwarships.asia

Genre - Simulation • Developer - Wargaming • Publisher - Wargaming • Platform - PC



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F1 2015

CAN CODEMASTERS RECAPTURE THE MAGIC OF F1?

Formula One is often regarded as the pinnacle of motorsport. The thrills, the glamour and the death-defying peril of 20 cars hurtling nose to tail at insane speeds has captivated millions of people worldwide for decades.

In the gaming world, developers have attempted to recreate the world of F1 as close to the real thing for over 30 years. Today, Codemasters are the sole holders of the official F1 license, and F1 2015 marks their seventh F1 game. This is a reboot of the franchise, with updated visuals, audio, car physics and AI being touted by the developers.

For the most part, these aims have been achieved. The visuals on the console versions have seen a noticeable bump from the older titles, with the game running at solid 60 frames per second in most situations. This even pertains in some of F1 2015's most stressing situations, with fantastic lighting provided in night races and rain effects that visually rival Project CARS' wet weather effects without sacrificing visual fluidity to achieve these results.

However, in direct comparison to PC versions of prior Codemasters F1 games, F1 2015 is a visual disappointment, mainly due to bizarre decisions regarding post-processing effects. Motion blur and depth of field effects are over-abundant and combined with a poor implementation of chromatic aberration, F1 2015 exhibits a washed up, blurry image that compares negatively to the prior F1 games.



This is a massive let down considering how well the other areas of focus have turned out. The breed of F1 cars provided in F1 2015 are without a doubt the finest Codemasters has provided in any of their F1 titles to date. They accurately portray the complexities of the turbocharged engines powering modern F1, with the huge amounts of torque providing a tricky but rewarding experience when you find the balance between throttle application and wheel spin when powering out of the corners.

While enthusiasts may complain that Codemasters has once again opted to create a simplified driving model to allow these cars to be drivable for those on gamepads, these cars are by no means easy to drive and provide a fun alternative to those seeking utmost realism.

The new AI system has upped the aggressiveness of the AI drivers and made them smarter when defending positions and overtaking, two areas where the AI struggled in Codemasters' previous efforts. They also seem to have given a natural dose of imperfection, with AI-only crashes occasionally spicing up races to good effect.

The improved wheel force feedback effects are also much more informative about the state of the car. They still may not rival the intricate effects provided in other racing sims, but they are a marked



improvement from the previous games.

Codemasters' F1 games have had a poor track record for bugs in their early post-release stages, and sadly this has continued in F1 2015. At the time of writing these issues have made an entire game mode, the online multiplayer, basically unplayable, with random disconnections, disappearing cars, non-existent corner cutting penalties and atrocious netcode currently littering this area of the game.

This is especially harmful considering F1 2015 suffers from a distinct lack of content. Outside of quick races, completing a championship season as your favourite driver and time trials, multiplayer is the only other mode you can play in F1 2015. Gone is the lite-RPG career mode that simulated taking your own driver through the ranks of F1 across multiple seasons, and gone are the classic cars and the challenge modes that added to the experience in the previous games.

Even the safety car feature has seen the cutting floor, removing a large layer of strategy that can sometimes turn races on their head. This is nullified somewhat by the inclusion of the full 2014 F1 season, but there is no doubt this fresh approach to the franchise will upset many fans.

F1 2015 is one of the greater disappointments of recent racing game releases. The improvements to the driving model and the AI have been drowned out by a bug-ridden mess of an initial release that is light on content. The visual engine improvements have likewise been hurt by poor choices for visual direction and post processing. A long road of patching awaits, and while many of the issues may eventually be addressed, it is hard to recommend F1 2015 in its current state.

Justin Talent

KEY SPECS

www.codemasters.com/game/f1-2015

Genre - Racing • Developer - Codemasters Birmingham •

Publisher - Bandai Namco Games • Platform - PC, PS4, XBOne

OVERALL

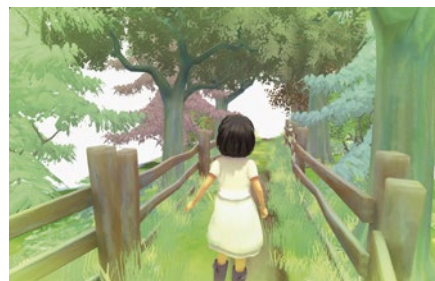


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Beyond Eyes

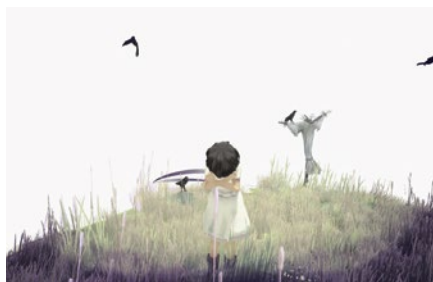
THERE'S NONE SO BLIND AS THOSE WHO WILL NOT LISTEN

Videogames are by necessity a very visual medium not only due to the nature of the art form but also because of the fact that the most easily demonstrable element of advances in gaming is increasingly higher resolution graphics running at increasingly higher framerates. That said, the fact that gaming is a visual medium does not stop enterprising developers from exploring different facets of the sensory spectrum. Beyond Eyes is such a game, in which the graphics are used to illustrate how a blind person perceives the surrounding world through their remaining senses. It's a strange and beautiful thing.

Beyond Eyes initially started as a graduation project for a bachelor's degree in game design but transformed into a three and a half year solo labour of love for designer Sherida Halitoe before the title was picked up by indie games publisher Team 17 last year and given a budget and team. Much like the majority of development, the game is a solitary affair. The game's protagonist, Rae, is a 10-year-old girl. When Rae was younger, an accident involving fireworks left her blinded and scarred physically and emotionally. Stripped of her sight, Rae began to fear the world outside of her comfort zone, avoiding public places and quivering at loud noises. She became socially isolated and withdrawn, preferring to stay in her garden. One day, she meets a new friend – a neighborhood

cat that comes by to play. The cat is the closest friend Rae has had in years, but when her friend vanishes one day, Rae must find the courage to finally break her isolation and explore more of the world.

As Rae wasn't born blind, she has some sense of how things look and a child's imagination, so the world around her is painted in bright colours and idealised depictions of life. The visuals have a soft, watercolor-like quality to them that seem to capture a sort of idyllic representation of childhood and familiar things, but these visuals never fill the screen entirely – there is always bright white space surrounding Rae, conveying to the player that she cannot grasp the entirety of her surroundings like a person with perfect sight would. When things like rain create a lot of noise that clogs out other things, the area begins to shrink. If she starts to feel scared or uncomfortable, the warm white surroundings transition into a cold, worrisome black. Rae starts moving more slowly when worried, and the world starts



losing some detail as she focusses in on the threat.

Rae's sense of hearing is sharp but it is also somewhat unreliable due to her idealised memories of what the world looked like when she could see. The sound of running water could immediately fill in the world with a beautiful fountain or a babbling brook when in reality she is approaching a water main or storm water drain. Only when her other senses come into play – smell and touch primarily – is the picture more fully revealed. Her hearing is also used as a navigational device, with some distant sounds such as birds or church bells being filling in a small distant pocket in the white expanse of the level, giving the player something to orient toward and make a goal of. Of course the distant sounds don't always lead where expected. This idea of memory overriding senses makes for an interesting take on the unreliable narrator.

The two levels we've had the chance to play so far – both essentially working as tutorials – didn't exactly have much in the way of what most people would consider traditional gameplay, with Rae slowly making her way around, the world pained in like a watercolour around her, filling in small details and drawing out the path that needs to be followed. Birds chirp, water flows, another little girl points to her ball and calls out to Rae, but rather than having them as interactive elements, Beyond Eyes is instead content, at least in what we players, to use these events and features to enliven the soundscape and palette of a blind girl's world. Even without any particularly gamey features, Beyond Eyes is shaping up to be a unique and quite affecting experience and we're looking forward to getting our hands on the final code.

Daniel Wilks

KEY SPECS

www.beyondeyes-game.com

Genre - Adventure • Developer - Tiger and Squid • Publisher - Team 17 • Platform - PC, Xbone, PS4

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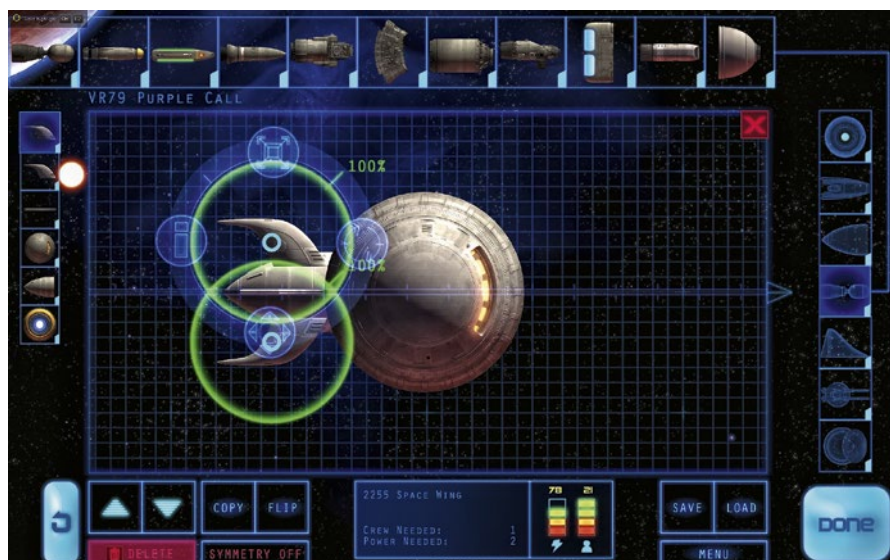


Defect

MUTINY ON THE (SPACE) BOUNTY

When you're the captain of the most powerful ship in a sector of space you are, by default the most powerful person in that sector, so it's not surprising that there is a long line of mutineers willing to eject the captain into space for a chance to sit in the big chair. This conga-line of mutineers forms the crux of Defect, the Australian made 'Spaceship Destruction Kit'. Build a ship to complete a combat mission only to have it taken from you by the crew at the end of the mission, build a new ship to tackle the next mission only to face the last ship you lost. It's this idea of having to face your last ship in combat that informs the title. Players must build a ship powerful enough to complete a mission and defeat the last ship they built but must built in a defect or weak point that can be exploited in the next mission. It's both a fun and funny premise that proves to be one hell of an escalating challenge.

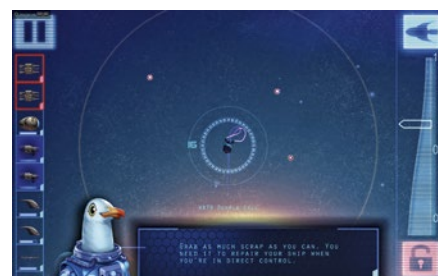
The game is split into three phases, the first being ship building, the second combat and the third the inevitable mutiny. Building a ship is a simple task based around a power core. Each power core has a different amount of available energy, the default currency for what other parts are fitted to the ship. Different engines have different manoeuvrability, thrust and acceleration, crew quarters and cabins can hold different numbers of crew members and may be armoured. Weapons have different firing effects and ranges. Wings enhance manoeuvrability and so on. The core and the crew compartment give a baseline for the amount of power and number of crew available to build your ship using a simple drag and drop interface in which players can resize, mirror and position components to put their ship together.



The top down perspective means that the way the ships parts are layered effects the way they are integrated into the ship – putting the core on the top layer leaves it vulnerable to attack but putting it under an armoured section gives it some protection, but putting too many layered parts in the same place can cause overheating or problems with the core.

Once the ship is finished it's time to launch into the next mission. The demo code we have played sets the player on a hexagonal grid map with each successive mission unlocking the neighbouring tiles. We didn't experience much variation in the mission structure either, but this will undoubtedly change when the finished game is released. Although Defect is, at its core, a space combat game, it's more akin to a *ship* combat game than it is an active space shooter. Rather than directly controlling the weapons of a ship, players instead have control of thrust, acceleration and direction, with weapons automatically firing when in range of a target. The momentum of the ship is the key factor when it comes to flight. No matter how manoeuvrable a ship, the lack of friction in space means that the forward momentum is the deciding factor when it comes to slowing down, turning or changing direction.

Due to this control system, Defect feels something like a naval combat game, with players having to judge their approach vectors and angles of attack to use momentum to set up broadsides or to keep guns on the enemy as long as possible to inflict maximum damage before having to turn around to make



another pass. It's not the most action packed combat, but constructing the right ship for the right job and taking out waves of enemy ships followed by your previous ship is definitely a satisfying experience.

To improve the performance of the ship, players can take direct control over different components. Controlling the wings makes the ship turn easier, controlling the engines gives more thrust and manoeuvrability. Controlling the weapons allows the player to directly control turret guns, using the mouse to aim and spacebar to fire. It's a simple clever system that gives players that extra bit of ship performance when it's most needed. There is no confirmed release date as yet, but considering how polished the demo looks and the fact that the Kickstarter campaign was successfully funded in mid Just, we wouldn't be surprised to see a Christmas or early 2016 release.

Daniel Wilks

KEY SPECS

www.sdkgame.com

Genre - Space Combat · Developer - Three Phase Interactive
· Publisher - Three Phase Interactive · Platform - PC

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The good ship A-List holds its course steady this month.



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PRICE \$2,199

SUPPLIER www.apple.com/au

If you can afford it, the 27in iMac is the finest piece of all-in-one engineering on the market. A truly powerful beast with performance to match its looks.

SPECIFICATIONS 3.2GHz quad-core Intel Core i5; 8GB DDR3 RAM; 1TB Western Digital Caviar Black HDD; NVIDIA GeForce GT 750M 1GB; 27in 2560 x 1440 LCD.



PERIPHERALS

WIRELESS ROUTER Netgear
Nighthawk X6 AC3200

★★★★★

SUPPLIER www.netgear.com.au

Designed to keep pace with high-bandwidth content consumption, it is the router King.

SPECIFICATIONS 1GHz dual core processor with 3 offload processors, 6 High performance antennas, one 2.4GHz band and two 5GHz Wi-Fi bands

DESKTOP STORAGE CalDigit T3
with Thunderbolt 2

★★★★★

SUPPLIER www.amazon.com

The T3 is an expensive RAID device, but when you factor in the drives and the capacity included, it's good value.

SPECIFICATIONS 6/9/12/15TB external hard disk with RAID; Thunderbolt and Thunderbolt 2, 135 x 241 x 116mm 4.5kg.



NAS Synology
Diskstation DS415play

★★★★★

SUPPLIER www.synology.com

For most home users, the DS415play is very impressive. It's an all in one box that can literally do it all.

SPECIFICATIONS 24x SATA 3 2.5"/3.5" drive bays - Intel Atom Dual Core 1.6GHz CPU - 1GB DDR3 RAM - 2x USB 3.0 & 3x USB 2.0 - 1x Gigabit Ethernet

ALL-IN-ONE PRINTER
Canon Pixma IP 8760

★★★★★

SUPPLIER www.canon.com.au

This Canon can do it all, and at a reasonable price.

SPECIFICATIONS 9600 x 2400dpi print; 2400 x 4800ppi scan; USB 2; 802.11n WLAN; 150-sheet tray

LASER PRINTER Dell B1160w

★★★★★

SUPPLIER www.dell.com.au

The best all-rounder in our printer group test, with excellent text printing and decent costs.

SPECIFICATIONS 1800 x 600dpi resolution; USB 2; Wi-Fi; 150-sheet input trays; 331 x 215 x 178

LAPTOPS



VALUE Asus TF103C

★★★★★

PRICE \$429

SUPPLIER www.asus.com.au

While ostensibly a tablet with a removable keyboard, it also fits tidily into the value portable category thanks to its immense usability and remarkably low price.

SPECIFICATIONS Quad-core 1.86GHz Intel Atom Z3745 • 1GB RAM • 8GB/16GB eMMC storage • 10.1in 1,280 x 800 IPS display • dual-band 802.11n Wi-Fi



PERFORMANCE Aorus X7

★★★★★

PRICE \$2,999

SUPPLIER www.aorus.com

Super-sleek, light, outrageously powerful and with a spec-list that outclasses many high end desktop systems.

SPECIFICATIONS Q4-3.4GHz i7-4700HQ • 4GB/8GB DDR3L 1600, 4 slots (Max 32GB) • 17.3" Full HD 1920x1080 • NVIDIA® GTX 765M SLI GDDR5 4GB • mSATA 128GB/256GB, 2slot 2.5" HDD 500GB/750GB/1TB 5400rpm



PROFESSIONAL Apple Macbook Pro Retina

★★★★★

PRICE \$2,499

SUPPLIER www.apple.com/au

We've selected the 2.9GHz i5 model with 8GB of RAM and a 512GB SSD. Doubling the RAM adds another \$280. Some may find, though, the 13in screen size to be limiting.

SPECIFICATIONS 2.9GHz Intel Core i5; 8GB RAM; 512GB SSD; 13in 2560 x 1600 LCD; 2 x USB 3; 2 x Thunderbolt 2; dual-band 802.11ac abgn Wi-Fi



ULTRA PORTABLE Microsoft Surface Pro 3

★★★★★

PRICE \$1,549

SUPPLIER www.microsoft.com.au

Attach the Type Cover 2 and it's as good, if not better, than any 'proper' ultra portable laptop. It took three versions, but Microsoft has nailed this format. At least an i5 is recommended.

SPECIFICATIONS 1.9GHz Intel Core i5-4300U; 12in touchscreen (2160 x 1440); 8GB RAM; 256GB SSD; 802.11ac/abgn; Bluetooth 4

HANDHELDS

SMARTPHONE Samsung Galaxy S6

★★★★★

PRICE \$999

SUPPLIER www.sony.com.au

If only the best will do, look no further: the Samsung Galaxy S6 is the best smartphone on the market.

SPECIFICATIONS 2.5GHz Qualcomm Snapdragon Octa-core 2.1GHz/1.5GHz ARM Exynos 7420 SoC • ARM Mali-T760 GPU • 3GB RAM • 32/64/128GB storage • 5.1in 4K video • 2,550mAh battery • 1yr RTB warranty • 71 x 6.8 x 143mm (WDH) 138g



TABLET Apple iPad Air 2

★★★★★

PRICE \$539

SUPPLIER

www.apple.com/au

The iPad Air 2 is definitively the best tablet on the market right now, and rightfully replaces its predecessor on our A-List.

SPECIFICATIONS 1.5GHz Apple A8X SoC • 2GB RAM • 16/64/128GB storage • 9.7in 1,536 x 2,048 IPS display • 7,340mAh battery



EBOOK READER Kindle

★★★★★

PRICE \$109

SUPPLIER

www.amazon.com

The new model is quicker, slimmer, lighter and cheaper than before. If all you want to do is read books, its simple design and performance are perfect.

SPECIFICATIONS 6in e-Ink screen, 170g weight, 114 x 87 x 166mm, 2GB memory, 10-day battery life • WEB ID 279534



SOFTWARE

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★★★★★

SUPPLIER www.norton.com/security

Great malware protection and equally good legitimate software recognition

BACK UP Acronis True Image 2015

★★★★★

SUPPLIER www.acronis.com.au

The 2015 version adds full-system backup and dual backup and unlimited cloud storage.

OFFICE SUITE Microsoft Office 365 Home Premium

★★★★★

SUPPLIER www.microsoft.com.au

The easiest to use Office to date.

WEB DEV Adobe Dreamweaver CS6

★★★★★

SUPPLIER www.adobe.com.au

This edition makes PHP and CMS its core focus.

AUDIO Cubase 7.5

★★★★★

SUPPLIER www.steinberg.net

The addition of better filters solidifies this program's continued place on the A-List.

VIDEO Sony Vegas Movie Studio HD Platinum 11

★★★★★

SUPPLIER www.sony.com.au

May not have the bells and whistles of other consumer editing packages, but its tools are efficient.

PHOTO Adobe Photoshop Lightroom 6

★★★★★

SUPPLIER www.adobe.com.au

Lightroom 6 doesn't add up to a revolutionary update, but it improves on what was already an exceptional piece of software.



The Kitlog




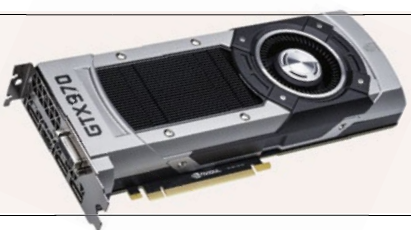
DREAM BUILDS WITH REAL GEAR

We had some small hope that AMD's sort-of-but-not-really 'new' R9 video cards might provide something to consider for the Game Box. But, no. As you can see in our group test (starting on page 52), AMD has disappointed us.





But the wonder that is the Nvidia GTX 980 TI continues to astound. This month we have reviewed the MSI take on the Maxwell GPU – the Gaming 6G card. It's faster than the Gigabyte GV-N98TG1 Gaming 6GD that went into the Perfect PC just last month thanks to a higher clock speed (1178MHz Base vs 1152MHz for the Gigabyte, and 1279MHz Boost vs the Gigabyte's 1241MHz).

These are more than slivers of difference, but really it's still splitting hairs and you won't be disappointed with any variant of the 980Ti, it's just that MSI has pushed above and beyond and that effort and achievement deserves recognition here in the Perfect PC.

THE GAME BOX

CPU	 <p>INTEL CORE I5 4690 PRICE \$295 A stock speed of 3.5GHz and turbo at 3.7GHz is all the gaming grunt you need right now.</p>
MOTHERBOARD	 <p>MSI H97 GAMING 3 PRICE \$159 Everything you need on a gaming board at a very nice price. The H97 chipset will limit overclocking, but the stock CPU has the beans for any game.</p>
MEMORY	 <p>KINGSTON HYPERX BEAST 16GB PRICE \$219 Our roundup award winner, it's well-priced, fast and overclocks very well.</p>
VIDEOCARD	 <p>NVIDIA GTX 970 PRICE \$500 Quiet, sips power, but when the performance is needed this blazer eats up the frames.</p>

THE PERFECT PC

CPU	 <p>INTEL CORE I7 5820K PRICE \$535 Six cores, plus an additional six Hyper-Threading cores.</p>
MOTHERBOARD	 <p>GIGABYTE X99 SOC CHAMPION PRICE \$420 Supreme engineering and component quality for rock solid reliability.</p>
MEMORY	 <p>CORSAIR DOMINATOR PLATINUM CMD32GX3M4A2133C9 32GB PRICE \$640 These memory chips are hand selected and tested, and 32GB of fast RAM will keep things smooth and fast in intensive tasks.</p>
VIDEOCARD	 <p>MSI GTX 980TI GAMING 6G PRICE \$1089 Faster than a Titan X and several hundred dollars cheaper, this is the 980Ti to have right now.</p>

TOTAL: \$2955 RIG ONLY: \$2078

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SYSTEMDRIVES

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KEYBOARD

CORSAIR K70

PRICE \$170

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DISPLAY



LG IPS277L

PRICE \$499

27 inches of IPS glory. The resolution isn't perfect, but the price is. The thin bezel makes this a very attractive screen.

MOUSE



RAPOOH V900

PRICE \$69

Accurate, good lift-off performance and decent ergonomics at a fairly amazing price.

AUDIO

HYPERX CLOUD II

PRICE \$149

The HyperX Cloud II provide excellent sound quality and not just for the price range.



SOUND BLASTER X-FI XTREME

PRICE \$80

The best positional game audio at this price and good music quality.

POWER SUPPLY

COOLER MASTER G750M

PRICE \$125

Outstanding value for money, it's powerful enough for even performance PCs packing twin GPUs.



TOTAL: \$6017 RIG ONLY: \$4765

COOLER



CORSAIR H100i GTX WATER COOLER

PRICE \$179

Excellent cooling that is easy to install with advanced monitoring.

CASE



CORSAIR GRAPHITE 380T

PRICE \$259

Lovely form and brilliant function along with the highest quality.

SYSTEMDRIVES

INTEL 750

PRICE \$1499

This is easily the fastest consumer drive we have tested, and by a large margin.



SEAGATE BARRACUDA 2TB

PRICE \$100

Supplement the PRO with cheap HDD storage.

KEYBOARD

CORSAIR VENGEANCE K95

PRICE \$189

The perfect keyboard. Lovely Cherry Red mechanical switches, a slick and attractive aluminium body and customisable backlighting make this The One.



DISPLAY



PHILIPS BDM4065UC 4K 40"

PRICE \$1033

It's huge, remarkable value and having one in front of you is PC paradise.

MOUSE



CM STORM REAPER

PRICE \$85

Very solid and feels fantastic under the hand with sweet on-screen movement.

AUDIO

CREATIVE SOUND BLASTER ZXR

PRICE \$289

Superb music and general audio, with the versatility of a comprehensive set of connectivity options.



POWER SUPPLY

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PRICE \$299

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Seagate Seven portable drive, awarded the prestigious iF Design and Red Dot award, is a high-design ultra slim external drive embodying the latest trend in mechanical design, with a depth of 7mm making it the slimmest way to carry 500GB of data. The simplicity of the industrial design of the Seagate Seven pays tribute to the roots of computer storage while simultaneously celebrating the latest advancements in storage innovation. The premium all-metal enclosure made entirely of steel highlights the essence of a bare hard drive, Seagate's core competency for over 35 years.

Seagate Wireless is the newest addition to its family of wireless storage solutions and it will become a mobile devices' favourite companion. The 500GB portable wireless drive is designed to stream HD videos on mobile devices and enable users to offload media to preserve storage space on their smartphones and tablets. With space for up to 200 HD movies, users will never be without entertainment, even when on the road without Internet access. The new Seagate Wireless comes in a range of vibrant colours — lime green, cool blue, slate grey, fire-engine red and white.



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THE BACK SECTION

Real world experience, the newest of the new in tech and some strong opinion

WINDOWS 10 Honeyball likes it! 100

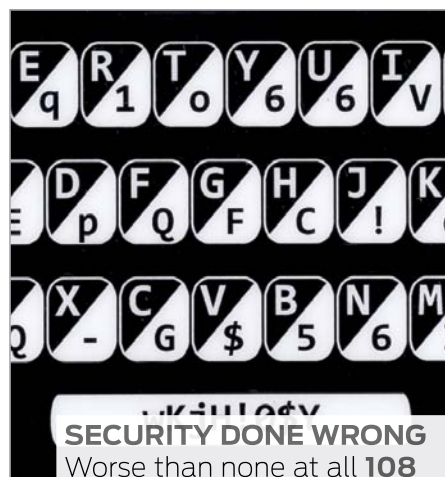


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AIRCRAFT MAINTENANCE DRONES Little does 92



MAKE GOOGLE NOW WORK FOR YOU

Google's personal assistant is a key feature of your smartphone and tablet. **Barry Collins** reveals how to get the most from it

Google Now is arguably a better electronic PA than Apple's Siri or Microsoft's Cortana. For starters, it's the only one of the three virtual assistants that's properly cross-platform. Google Now comes built into Android smartphones, tablets and smartwatches, but is also available on PCs – through the Chrome browser – and rival mobile platforms via the Google app.

Undoubtedly, however, it works best if you're fully committed to the Google lifestyle. If you collect your email via Gmail and plug your appointments into Google Calendar, it gives Google Now a wealth of information from which to learn. But it's smart enough to learn your habits without help. Visit the gym every Tuesday night at 7pm, and before long Google Now will be letting you know when you should set off to get there, taking into account live traffic or public-transport delays.

It's also possible to set reminders, send messages, open apps and much more with simple voice commands. In fact, the problem with Google Now is that it does so much, you can easily miss the best of it.

HOW TO GET GOOGLE NOW

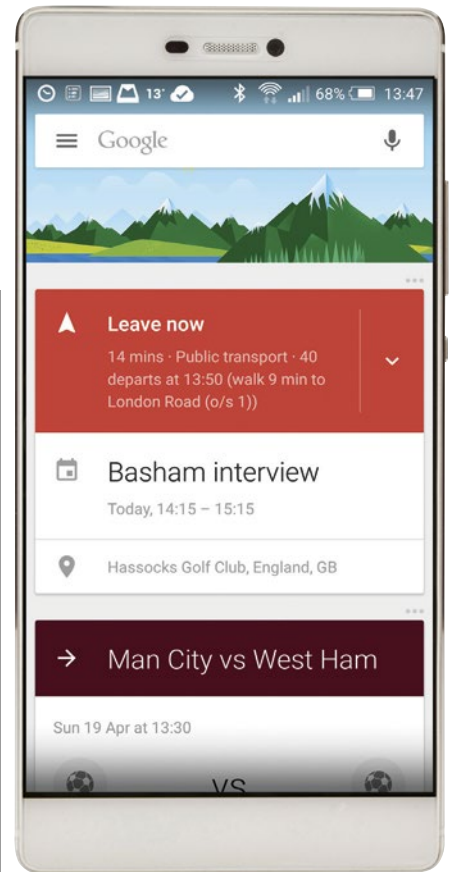
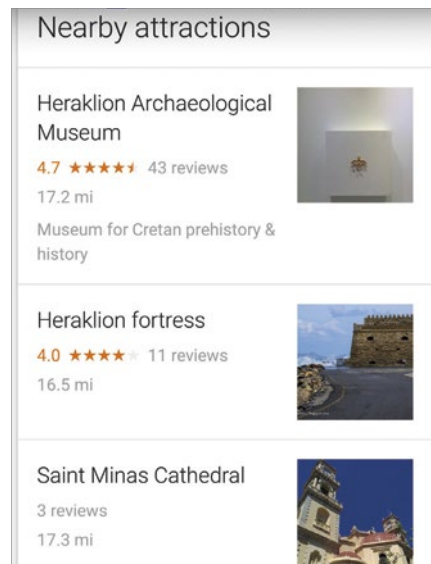
If your smartphone or tablet runs the stock Android OS, you'll find Google

Now by swiping up from the Android homescreen to reveal the system's characteristic "cards", which carry information on different topics. If your OS has been customised by the device manufacturer, this may not work, but you can put Google Now at your fingertips by installing the free Google Now Launcher (pcpro.link/251gnow). This replaces the manufacturer's homescreen with one that looks and feels more like stock Android, with the Google Now cards available by swiping to the right instead of upwards.

iPhone and iPad owners aren't left out either, although it's not as convenient to access Google Now on an iOS device thanks to Apple's insistence on locking down the homescreen. To find the cards, you must install and launch the Google app, and then swipe upwards from the bottom of the app's screen. Alternatively, the latest Chrome browser for iOS comes with an optional widget that allows you to issue voice searches and commands from the iOS Notification Center.

Google Now also runs on Android Wear smartwatches; alongside app notifications, you'll see all sorts of handy information pop up on the small screen via Google Now cards, which you can scroll through using the device's touchscreen or swipe away to dismiss.

✓ Google Now comes into its own when you're in unfamiliar surroundings



△ Google Now can read your calendar and emails to give you advance warning of upcoming appointments

And, of course, Google Now's voice-control capabilities are key to using it on a watch, since the hardware doesn't have a keyboard. Likewise, Google Glass – the company's experimental augmented-reality headset – can show cards for sports results, upcoming appointments, nearby restaurants and more. Now has to be actively switched on for Google Glass, though: if you're one of the few people out there using the headset, go to the My Glass website (google.com/myglass), click on Glassware and toggle the Google Now card to On.

On the desktop, Google Now is available via Chrome notifications. To check your settings, click on the bell icon in the system tray at the bottom right of the Windows desktop, then click the cog that appears in the bottom right of the pop-up window and check that Google Now is ticked. If it is, you should receive notifications for stock price changes, upcoming meetings and all the other things that Google Now handles, which we'll discuss further below. From here on, we'll assume you're using Google Now on an Android smartphone or tablet, since this is the most common scenario, but the system works similarly across wearables and the desktop.

MAKE SURE GOOGLE'S ALWAYS LISTENING

On some native Android devices, Google is always listening for the "OK Google" command – so you can access it when you're using an app, or when the device is locked. If you're using the Google Now Launcher, however, Google listens to your voice only when you're on the Android homescreen. If you want to be able to bark "OK Google" at any time, find the Google Settings app on your phone, select Voice and click "OK Google detection". Here, there's an option to set it running from any screen. You'll be required to say "OK Google" three times to make sure the device is fully trained to your voice. Be warned, though – having your phone constantly listening out for your voice will have a small but detrimental impact on your battery life.



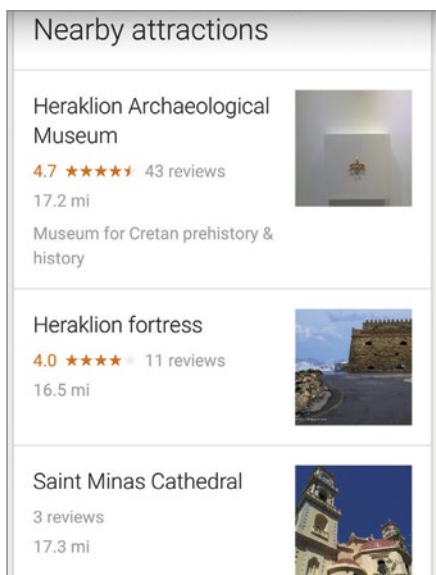
TRAINING GOOGLE NOW

To get the best from Google Now, you need to train it so that it gets a feel for your interests. To begin with you'll see a selection of default cards – things such as weather, stock prices and news. You can temporarily dismiss a card by swiping it away; if you don't want to see a card permanently then click on the three dots icon just above the card. You'll be asked questions that can help make the card's content more interesting – do you want to see a certain team's sports results, for instance – and given the option to switch off the card. If you run out of interesting cards, swipe to the bottom of the pile and select More. Google will then suggest other categories that may be of interest.

In the first few weeks, Google Now will ask you lots of questions. Are you interested in travel updates to this place? Do you want to see news on this topic? The questions can be tiresome, but they help Google Now get a grip on your interests; the nagging slows in time. You don't have to repeat it on multiple devices: the preferences you specify on your Android phone carry across to your iPad.

As we mentioned above, Google Now works best in partnership with other Google services. If you've previously entered your home address into Google Maps, for instance, Google Now will automatically let you know when the last train home is leaving. If Amazon and others are sending delivery updates to your Gmail address then Google Now can track your parcels' progress. If you're getting such information sent to other inboxes, it might be worth migrating to Google if you want to make Now as

✓ Google Now comes into its own when you're in unfamiliar surroundings



"In the first few weeks Google will ask you lots of questions; while tiresome, they help Google Now get a grip on your interests"

useful as possible – or at least forwarding certain messages to your linked Google account.

CUSTOMISE YOUR CARDS

Google Now offers a wide range of cards, many of which are context-sensitive: for example, some will appear only when you're away from home; others appear only at certain times of day.

Following are top tips covering most of the most common ways that you can get the most from the more useful cards:

EVENTS

Google Now keeps track of upcoming appointments in your Google Calendar, and scans Gmail messages for mentions of timed events. If it finds something that looks relevant, Google will often highlight the relevant text ("meet you at Town Hall station at 4.30pm tomorrow") and ask you if you want it to keep track of this event.

You'll then be told how long it will take to get there, and receive a Leave Now notification when it's time to go. Google will try to guess your mode of transport; if it gets it wrong you can click on the down arrow next to the journey time/leave now warning and select car, bike, public transport or walking. Directions and journey times will change accordingly.

TRAVEL

If boarding passes or flight confirmations are sent to your Gmail account, Google will automatically extract the flight number and show departure information in the hours before take-off, as well as reminding you when it is time to leave for the airport.

Then, once you reach your destination, Google Now turns into a tourist guide. Nearby attractions are highlighted, along with ratings and distances from your accommodation. You can swipe away an attraction you're not interested in, or click on one to get directions in Google Maps. Leave the map open and you can use GPS to plot your walk/drive on that map, without having to keep your expensive roaming data switched on.

Other tourist tools that appear in Google Now include an instant translator (when you're in non-English-speaking countries) and a currency converter.



▲ Reminders and notifications can be sent directly to your Android Wear smartwatch

NEWS AND WEBSITE UPDATES

Google uses your web history to promote news stories in which it thinks you might be interested. It does a surprisingly good job, but to further train it you can swipe away stories you're not interested in (Google may ask if you want to continue to receive updates from that site). Or click the three dots above the card and answer questions on your interests.

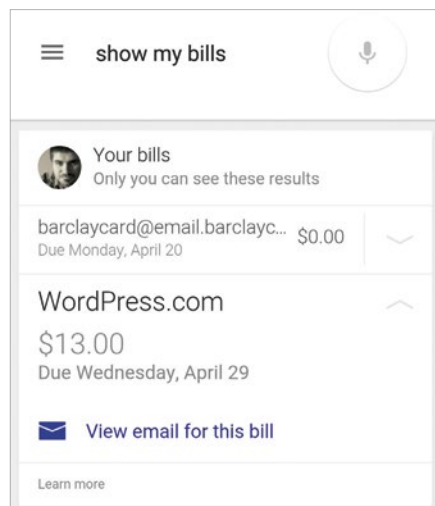
SPORTS

For sports fans, Google Now is the new Teletext. The first time you click on the Sports card, Google will ask which team you support. A day or two before fixtures, you'll see a reminder card appear, and live score updates will be posted during and after matches.

If you're holding out for Match of the Day and don't want to know the outcome, Google Now has a nice built-in tool to protect against spoilers. Click the three dots above the Sports card and flick through until you see the option to hide scores to avoid spoilers. You can also enter additional teams here if you're interested in more than one club – prominent football, cricket, rugby and other teams are available.

TV AND VIDEO

This occasional card recommends films and television shows that are being broadcast now or are available through streaming services, based on your search history. Tapping the listings will often take you directly to the relevant app (such as Netflix). If you click on the "hamburger" icon (three horizontal bars) in the Search bar, and navigate to Settings | Customise | TV & Video, you can tell Google Now which video providers you use, and optionally tell it to only notify you about shows that you can watch via a Chromecast device.



▲ Bill-tracking is one of Google Now's lesser-known capabilities

FITNESS TRACKING

If you're using an Android wearable, you monitor your daily exercise targets via Google Fit: its Google Now card will tell you how much activity or how many steps you need to hit your daily target. You can also connect apps such as Strava and Runtastic to Google Fit; they have their own cards for Google Now.

GOOGLE NOW ACTIONS

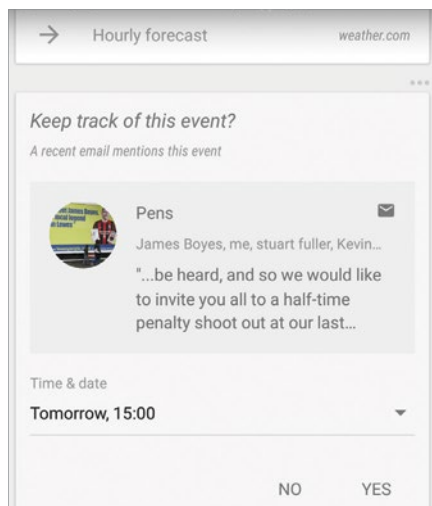
Google Now isn't just about pushing information at you. You can also give it instructions, in the way you would a real personal assistant. Most of these can be issued verbally, by saying "OK Google" at the Android homescreen, or tapping the microphone button in the search bar.

SET REMINDERS

You can set time- or location-based reminders, either by speaking or typing them into the search bar. You might say "remind me to email Tim tomorrow morning", or "remind me to pick up flowers when I leave work". By default your reminder will be a discreet notification; to set more audible notifications in Android, open Google Now's settings, Select "Now Cards" and change Urgent Updates to Ring Tone.

TAKE NOTES

Ask Google Now to "take a note" and it will listen while you dictate a short memo. Don't pause for too long between words or it will assume you've finished. Google will ask you which app you want to file it in. If you have a dedicated note-taking app such as Evernote, the text can be added automatically; you can also file a note to Gmail, which will send it to you via email marked "Note to self".



▲ Google Now can set reminders for events mentioned in your email

SET TIMERS AND ALARMS

Got something in the oven? Ask Google Now to "set timer for 20 minutes" and it will beep when your meal is ready. Likewise, tell Google Now to "set an alarm for 6.15am" and you can be assured of an early-morning wake-up call.

KEEP ON TOP OF YOUR BILLS

If credit card, utility or web-hosting bills are sent to your Gmail inbox, Google Now may be able to pick out the amount owed and the payment deadline. Ask Google Now to "show my bills" and you'll receive a list.

FIRE UP THE GPS

Ask Google Now to "navigate to 30 Cleveland Street" or "navigate to home" and it will launch Google Maps

Navigation, choose the fastest route and start announcing turn-by-turn directions. It's a handy feature if you have the phone mounted in the car and need to get somewhere, all without tapping repeatedly at the screen.

PLAY YOUR MUSIC

If your MP3 library is stored in Google Play Music, you can simply tell Google Now to "play some music" for a random hop through your collection. Or ask it to play specific tracks, albums or artists by saying "play" and then the relevant name. If you have multiple music apps installed, you might be asked to choose which one to play with. Alternatively, you can issue app-specific commands such as "play Elbow in Spotify", which starts a random selection from that artist.

SEND MESSAGES OR EMAILS

"Dictating an SMS or email message can be faster than fiddling with a software keyboard. First say "text Steve Pooley" or "email Dad" (if Google Now has learnt your relationships); you may be asked to choose between different accounts or numbers. Google will then invite you to speak your message. You'll be asked to confirm whether you want to send the message, as transcribed, at the end.

OTHER ACTIONS

Discover more Google Now capabilities by simply saying or typing "help"; you'll be given a selection of suggested voice commands. Setting calendar appointments, calling up flight information and checking stock prices are among dozens of other options. ●

TORQUE: MICROSOFT'S ANSWER TO NOW

Android users aren't stuck with Google Now if they want a voice assistant. Microsoft has some skin in this game too, with its free Bing Torque app available for Android smartphones, tablets and selected smartwatches.

Torque shares many of the features and commands of Google Now, although it isn't activated by voice, but rather by shaking the handset. And unlike Google Now, it opens in a tiny window overlay within your existing application, so – for example – you can perform a quick search for the dollar exchange rate while planning your forthcoming trip to the US.

Torque can be used to place calls, set alarms and open applications, but not everything works quite as smoothly as it does with

Google Now. When we instructed Google Now to "text Darien", for example, the system would always find our very own Dr Graham-Smith. Torque, by contrast, was constantly looking for a "Darren", and struggled similarly with other place and company names. When we did manage to access our address book and dictate a text message using Torque on our HTC

One handset, we found the message sitting in our Drafts folder after it had supposedly been dispatched.

Overall, we found Google Now more useful, but Torque is handy for quick searches, and there's no harm in having both – not least because we suspect Torque will only get better as Microsoft extends the features of the Cortana voice assistant in Windows 10.





DAN PAGE VR CONSULTANT

We look at jobs in IT and talk to someone in the field

WHAT DOES YOUR JOB INVOLVE?

I do internal and client consultancy at a studio called Opposable Games. My role includes brainstorming and working out what will and won't work when it comes to VR. I might advise a client on tools for gestural input or haptic feedback, or on gaze direction. VR is a learning curve for the whole industry right now, but because of my contacts, and the fact that I've tried many of the available demos, attended various conferences and read a lot on the subject, I'm often called upon for advice.

HOW DID YOU GET INTO THIS LINE OF WORK?

Originally I saw the job opening in the Bristol Games Hub newsletter; it was really a part-time marketing position. But I've always been very passionate about VR, and Opposable Games was already into the technology – it had already made an Oculus game called Tear Bears, which was one of the first on the Oculus Share site. I was quickly able

to get involved in that side of things and make the job my own.

WHAT ORIGINALLY ATTRACTED YOU TO VR?

It goes back to being a kid and reading lots of sci-fi books, and never really losing my interest in that. As soon as the Oculus Rift Kickstarter appeared I began to pay close attention to what was going on. When a local VR developer came to a Bristol Games Hub social with a Development Kit, I had the chance to have a go. Since then I've become a VR news addict – and that's a big part of my job now. I run the SouthWest VR social-media accounts and put out a regular VR newsletter. I keep an eye on the Oculus forum on Reddit (reddit.com/r/oculus), and my TweetDeck is verging on the ridiculous.

WHAT TECHNICAL SKILLS DO YOU NEED?

I wouldn't say mine is a technical role as such – I'm not trained as a developer – but I do work with people who are technically minded, so need the ability to understand what is and isn't possible with both the hardware and software. As an example, if a client wants to make something for Google Cardboard, they need to know that it won't be particularly high-res, nor be very good in terms of latency. For something hi-res, I might advise upon a Samsung Gear VR experience instead; it won't be able to handle a high-poly 3D load, but they could use 360 video and have something that looks great. Basically, if someone is planning a VR project, they might ring me up wanting to know what is and isn't viable.

WHAT ADVICE WOULD YOU GIVE TO SOMEONE WANTING TO TAKE ON A SIMILAR ROLE?

It's a very interesting time for VR. There are startups everywhere taking on both hardware and software specialists. However, startups don't often have the money to pay for recruitment agencies; when they're looking to fill a role, they might just put out a tweet or post something on Facebook. So it's really about keeping your eye on the ball. Also, try to find your own niche: you might want to learn what

you can about using virtual reality in car design, engineering or architecture, or even in medical training. Or perhaps you just want to focus on making games – whatever it is, read what you can, and try to get as much hands-on experience as possible. For VR to make sense, you have to have a go.

What opportunities are there for career progression?

VR is very much an emerging market right now. It's the Wild West out there; kind of a land-grab situation. So there isn't much of a logical progression: it's more about seeing what can be done and using your imagination to see where things can go. In my case, shortly after joining Opposable Games, I came to the conclusion that maybe we should put on a conference about VR. So we did; all the big players turned up and it went really well. I was proud of that. I believe that as the company expands, things will naturally progress and my trajectory will move forward. Which is much the same for everyone in this industry right now.

WHAT ISN'T SO GREAT ABOUT THE JOB?

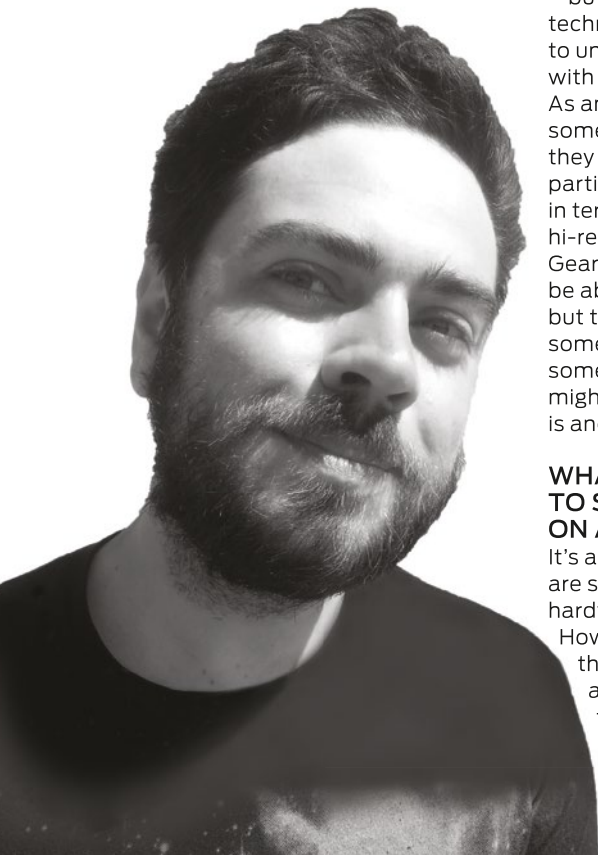
At the moment, since VR is all new and exciting, it's an incredibly friendly industry, with everybody helping each other out. In a few years, I think that will come to an end – it's going to be quite fierce in terms of competition. It's a shame but inevitable in any industry.

WHAT'S THE MONEY LIKE?

I left a full-time job and started out part-time, so the money was a little tight to begin with. But now that I've been with Opposable Games for more than a year full-time, life is good! There's no standard salary in VR yet; I'm not so sure there are many people that even share the job title. What you earn in the VR sphere – in different roles and different companies – is going to be all over the place for a while. It's a new world right now. It really is a fresh industry. ●

WHERE TO START

- Meant To Be Seen (MTBS): 3D certification and advocacy (mtbs3d.com)
- Virtual-reality news at Road to VR (roadtovr.com)
- News and reviews at VRFocus (vrfocus.com)





The best reason to buy an iPad

Your other favourite technology magazine now has an iPad edition featuring everything you love in the magazine plus exclusive extras each month including additional photography and video. Change the way you view your tech. Head to iTunes now to download the app.



LIFT-OFF FOR AIRLINE'S DRONE CREW

The budget airline is trialling maintenance drones, 3D-printed replacement parts and much more. **Nicole Kobie** reveals why the company is looking to the future

A maintenance drone buzzes through the air, scanning every inch of the surface of the aircraft. On the ground, engineers viewing images from the drone discover the problem: the exact spot where lightning struck the plane, weakening the structure and forcing it to be grounded.

This is a scenario European airline EasyJet is trialling, in an attempt to reduce groundings of aircraft from days to only hours. It's but one of a series of cutting-edge techniques the budget airline is testing to ensure its fleet remains in the air as much as possible.

EYES IN THE SKY

Lightning and bird strikes can ground a plane for days. Engineers must inspect the entire body of the aircraft, going up in cherry pickers to enable them to examine the plane from every angle. Now, EasyJet wants drones to carry out the

✓ The Riser uses Lidar lasers to detect issues on the surface of aircraft

exploration, with engineers examining the video from the ground – cutting turnaround time to just hours.

"A lot of people have thought that the drone is doing the inspection," Mark Bunting, EasyJet's drone programme manager, told *PC & Tech Authority*. "But our first version of this is [for the drone] to provide video footage to an engineer. It's actually an engineer's aid."

The initial thought was to manually fly a drone around planes, but that would require staff and a lot of setup, and would be harder to do outside without infrastructure to aid the drone. Instead, EasyJet worked with drone manufacturer Blue Bear and its Riser hardware, which is already used to carry out inspections of tall buildings and ships.

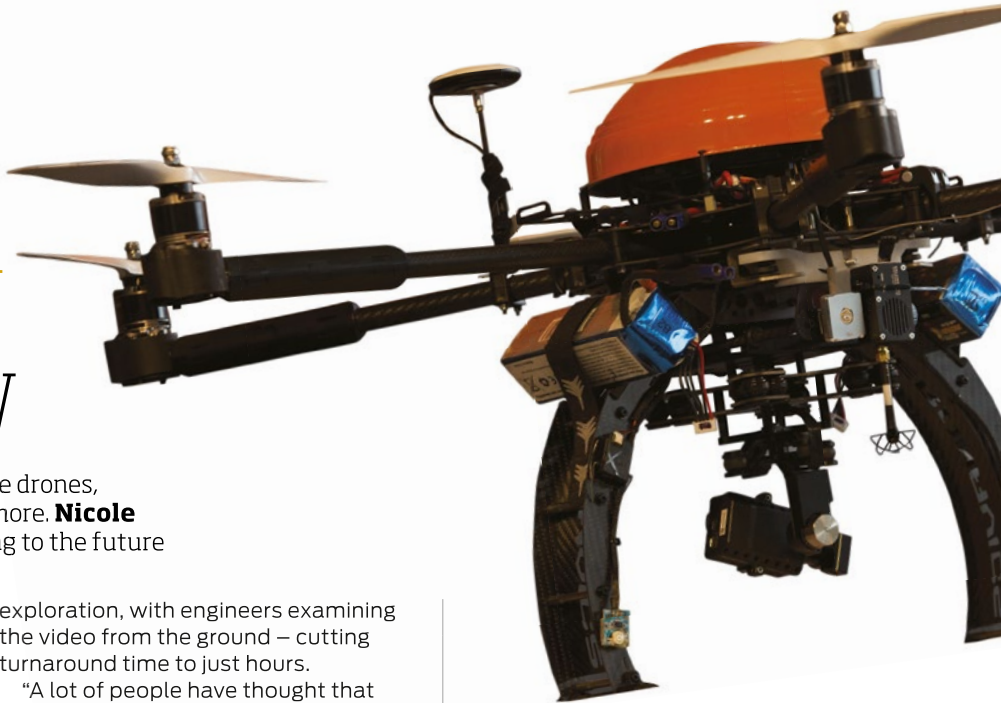
The Riser uses a pair of lasers, known as Lidar, for detection and ranging. Tell the Riser drone to stay several inches away from the plane, and it simply works its way around the surface from that distance. "The [drone] is able to fly safely around the aircraft and map all of it,"

said Bunting. "It's able to take a visual record of all of it."

Engineers appreciate the drone, because it spares them from having to clamber up and down in heavy machinery to examine planes. Plus, there's no concern over the drones making the engineers' jobs redundant. Bunting said the work still requires a human to judge the damage and assess what needs to be fixed. "There's no machine that can do that sort of job," he explained.

The next goal is to provide engineers with a better user interface. They aim to map the video onto a digital model of the plane, making it easier to locate the damage and automatically link to the relevant section of the manual, where material limits are documented. Currently, engineers still have to flip

✓ 3D printing could be used to replicate engine parts





through documentation to look up details such as this.

The airline said it's planning to bring the drones into service at up to ten of its engineering bases, including Luton and Gatwick, by the end of 2016.

3D-PRINTED PLANES

The interior of EasyJet's planes might soon be notable for something other than their orange decor, with plans to 3D-print window blinds, dropdown trays, armrests and other cabin furniture. Currently, spare seats and other replacement parts are stored in a warehouse, and shipped to airfields when needed, or they have to be manufactured on demand. "So the part is sitting on a shelf or it has a long lead

"EasyJet plans to bring drones into service at up to ten of its engineering bases, including Luton and Gatwick, by the end of 2016"

time," said Bunting.

To counter such issues, EasyJet wants to set up a high-end 3D printer, at Luton or another airport, which could be used to print parts for all of the airlines that operate there. It may seem surprising that airlines would use a 3D printer to replace seat parts, but in-cabin items are a pain point in the industry, not least because every airline has different seat designs. "Seating manufacturers can't keep up with maintaining stock, because EasyJet comes along and wants a slightly different seat design," he said.

FUTURE ENGINEERING

At the moment, the EasyJet trial is restricted to in-cabin items, but in the future the airline is hoping to use the printing technology for engine parts too. For that, it has to wait for the arrival of the LEAP (leading-edge aviation propulsion) engine, which features carbon-filter fan blades and a 3D-printed fuel nozzle. The latter was designed to be 3D-printed because it combined what was previously a multipart object into a

single piece, simplifying assembly and reducing fuel consumption. "They can effectively make a nozzle to work perfectly," Bunting said.

"And that's where the future in manufacturing with 3D printing is – design-to-print, rather than printing an old design," he said. "They've designed a fuel nozzle for the printing method, instead of designing a nozzle and then printing it."

SPENDING TO SAVE

It may be surprising to see such bleeding-edge innovation coming from an infamously cost-conscious airline, but EasyJet has a relatively modern fleet with which it's prepared to experiment. It currently has more than 200 planes, and is looking to add more than 100 new aircraft to its fleet. "We give people who are willing to come up with cutting-edge ideas access to our planes, our expertise

and operation," said Bunting.

The ideal outcome for EasyJet is discovering financial and time efficiencies – anything that would "make a huge difference" to how the company operates. "But we don't actually do much of the work ourselves," he said. "We engage with the people who are going to make money out of it. We have no interest in the intellectual property, nor in owning the product."

Instead, people such as Bunting work with tech suppliers to develop ideas and trial them. And it's a win-win situation. If the idea works for EasyJet, it's saving the airline money while, because of the size of its fleet, the supplier has a large market to instantly sell into. "And because of the size of our Airbus fleet, there's a knock-on [effect] into the aviation community, as everybody else benefits from it as well," Bunting said.

In other words, expect drones and 3D-printed armrests to take off for other airlines, too. ●



> Virtual reality is being used to help train EasyJet staff



SOFTWARE PLANE-SPOTTERS

It isn't only new hardware on which EasyJet has its sights; it's also looking to new fault-predicting software, virtual reality for training, and much more.

Working with aircraft maker Airbus, the firm is developing a "state-of-the-art, early-fault-prognosis tool" that will use in-flight telemetry to spot technical flaws before they become an issue. The software pulls in real-time data, mapping it on to an animated schematic that can be used to troubleshoot technical faults – even before the plane lands, according to an EasyJet technical document.

Planes aren't the only concern, with EasyJet working

with virtual-reality firms Output42, Design Q and Mediasphere, to make training and maintenance tools for cabin crew. The airline is testing a 3D laser technology that scans plane interiors, producing a 360-degree digital model in which crew can train; they learn their way around using an Oculus Rift headset. The firm is also using games with simulated customer-service scenarios to improve interactions with passengers, and developing a cabin-maintenance app to replace paper-tracking systems.

Of course, none of technologies mentioned will help you get through check-in queues any faster – but EasyJet has built an app for the Apple Watch with which to book and manage flights, too.





A TASTE OF 3D: FOOD PRINTERS HEADING FOR COFFEE SHOPS

3D printers may be adept at knocking out plastic toys and components, but what if they could rustle up grub? Well, thanks to XYZprinting, that's soon to become a reality. We spoke to CEO **Simon Shen** to find out more

3D printing has been used to build apartment blocks and create body parts – and now it's being used to construct lunch. XYZprinting's food printer was on show at January's CES, enabling coffee shops to offer bespoke cookies and the rest of us to create a meal via tubes of ingredients that are sprayed onto the plate. We spoke to CEO Simon Shen to find out if this is a tasty idea or a weirdly complicated way to make a pizza.

XYZprinting isn't new to printers. How did you come to develop a printer for food?

"We started in paper printers, meaning inkjet and laser printers, and we've been doing that for 15 years," said Shen. "We still produce 15 million printers per year." Two years ago, the company asked customers if they'd be interested in a 3D model. "They told me the 3D-printer market is very small, it's too early, they may not be interested at this point in time," he said. "However, we decided we may not be able to wait until the market matures. We need to spend our resources and develop 3D printers."

That led to the da Vinci line of consumer 3D printers, which picked up awards at CES, and the Jr edition.

How does a 3D food printer work?

One machine can print a variety of foods. As with existing 3D printers, it feeds the material through a nozzle, using different tubes of ingredients to make up the recipe. "You just pick up a tube from the refrigerator and you print with it," said Shen. "Then, it has to be baked afterwards." Imagine the 3D print jobs you do now, but with cookie dough instead of plastic, and you get the picture.

From an engineering standpoint, what's the difference between printing in plastic and printing with edible ingredients?

"The hardware design was not as difficult for us ... as the food," he said. The company hired a consultant to experiment with different ingredients and the "so-called compounds of the food". So far, the consultant has created recipes for cookies, chocolates, cupcakes, pizzas and macaroons.

Who would buy a 3D food printer?

Shen is already in talks with food retailers in Taiwan and Japan. "The idea they have is to put a 3D printer in hotels or coffee shops. For example, if you go into a coffee shop [with a food printer], you can have cookies made instantaneously with ... your own design, your name, the Hello Kitty sign, whatever," he said.

It's not only for novelty desserts. A Taiwanese convenience store is looking to use the machine to offer a wider range of



▲ The Nobel 1 uses SLA technology to print more quickly

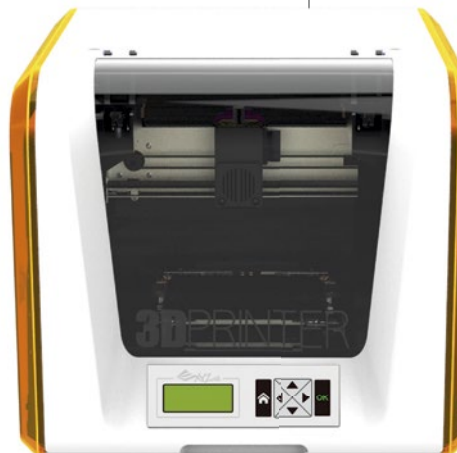
products. "All the [food] right now in the convenience store is prepackaged," he said. "But with 3D they can just print it."

Will this eventually end up in people's homes?

"I think every home will have one, just like every home has a coffee maker," Shen said. "Three years, five years, ten years down the road, if the price point drops to a certain level ... every home will eventually have one."

"In Japan, they are able to print bread. You can actually print that at home instead of buying it from the store," he added.

But the future may be odder still. "Some companies are trying to use our 3D printer to print meat ... and eggs," he said. Vegetarians may rejoice, but we'll reserve judgement until we've had a taste. ●



◀ The da Vinci Jr

WHAT IS... A DATA FURNACE?

Put the heat generated by a computer to good use: data furnace firm Nerdalize is offering free heating in exchange for running a server from your home

Data centres create huge amounts of heat, and keeping them cool can be a challenge, not to mention expensive and damaging to the environment. Research suggests that as much as 1.5% of electricity use around the world is devoted to powering and cooling data centres.

Rather than let that heat go to waste, some data centres are using it to warm other buildings – Swedish firm Bahnhof pumps it into Stockholm's municipal heating system, for example. Data furnaces take the concept further, placing the servers in people's homes, where the heat they generate is used for domestic heating. The first firm offering the service is Nerdalize, based in the Netherlands.



Here's how it works.

NERDALIZE TURNS YOUR HOME INTO A SERVER FARM?

Cosy. Not quite. Instead, it attaches a radiator-style box to an external wall in your home. Inside that lives the server equipment, which connects over your fibre internet connection to provide distributed cloud computing services to Nerdalize's customers. It's slightly larger than a standard radiator, and pumps out 1kW a day – about half the output of a standard radiator.

WHAT ABOUT IN THE SUMMER? Or if the internet goes down? Nerdalize's server radiators can be switched off, with the excess heat funnelled outside – which is why they must be installed on an external wall. And if your internet connection goes down in the winter, you won't freeze: the server has dummy equations to run if it has nothing better to do, so your home will be kept toasty.

WON'T THIS JUST RACK UP MY ELECTRICITY BILL? Nerdalize will pay for the electricity it uses. There is a €400 setup fee, and the startup won't pay for your internet connection.

HOW DOES NERDALIZE EARN FROM THIS? It sells access to the servers to

firms and universities. The startup claims the cost of its service is 55% cheaper than rivals, because it doesn't have the overheads created by data centres. However, because the servers aren't all in one place, the service isn't ideal for all, particularly those who require fast processing. Nerdalize says its grid computing is used for video transcoding, engineering models, and scientific computing – anything that benefits from parallel computing, but doesn't need to be done in a hurry.

WHAT IF THE HOMEOWNER FIDDLES WITH THE SERVER? It's secured, but if you tamper with it, Nerdalize can wipe the server so that you can't access the data. Plus, all data is encrypted. The creators argue that the distributed system is more secure than a centralised data centre, since it would be tough for hackers to locate all the points to target a specific company.

FREE HEATING, ENVIRONMENTAL BENEFITS, PLUS GEEK CREDENTIALS? Sign me up! Only if you're Dutch; Nerdalize is only available in the Netherlands, and there's no word yet on whether it will come to Australia. Give the startup a nudge by signing up for updates at nerdalize.com.

CROWDFUND THIS! CHATRBELL SMART DOORBELL

Our pick of tech projects on Kickstarter and Indiegogo



What is it?

Chatrbell is an update to your existing front doorbell, which is a rather analogue idea: when else would you ring a bell to get someone's attention? This isn't the Victorian era, when we had butlers to attend to such interruptions. Instead, Chatrbell sends a notification to your phone, after which you can either get up and open the door, ask visitors to identify themselves via the built-in chat service, or ask them to send a photo for identification.

So you still have to get up and answer the door?

Yes, it simply lets you ask who's there, but this means you won't miss a visit if you're in the back garden, or can make arrangements if you're away from home. For example, you can send a courier a message to direct them where to leave your package.

How does it work?

The Chatrbell "Flare" is a small device you stick on the inside of your door that sends your home ID signal out to visitors' apps. The signal is sent over Bluetooth via the iBeacon system on iPhones; Android isn't yet supported.

Wait, so visitors need the app too?

Yes, and that's one obvious downside to this project: both parties need to have the Chatrbell app installed, which seems rather optimistic. It would be simpler to tape a note on your door asking visitors to call your phone when they arrive – it's

hard to imagine that couriers infamous for failing even to ring doorbells to speed "deliveries" will take the time to install an app when faced with your doorbell-less home and a Chatrbell sticker in the window.

That sounds like a downgrade to the system, not an improvement.

Chatrbell's creator Andy Young says doorbell notifications are only the beginning. Features he expects to see in the future include remote door-lock controls, integration with existing entry intercom systems, built-in camera systems, and e-signatures for deliveries.

How much will this doorbell revolution cost?

For around \$30, you receive your very own Chatrbell Flare. At the time of writing, the project had raised only \$3600 of the \$170,000 target.



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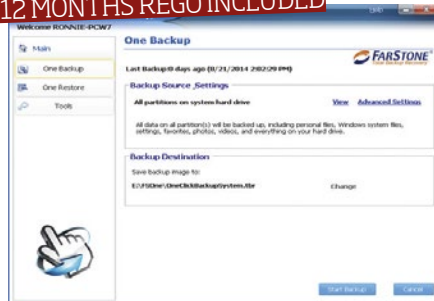
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FARSTONE ONE

FarStone ONE is a state-of-art recovery software. It creates an "One" golden image, a user can instantly restore a system with the "One" image. With the latest version, One is able to restore system on each reboot. A user can easily revert or undo any changes to a system by simple "reboot". Managing public computers in lab, library, company, and school has become simpler.

REGISTRATION & INSTALLATION:

Download and run OnePro-1.3-GM-ML-x64-20150403.exe
- Once you complete the installation process, run the application.
- On the main screen, click on "Help" on the top right hand corner. Then click on Register/Activation.
- Click on "If you have purchased the upgrade, please enter serial number here."
- Fill out UserName, Company and enter the following serial key in the serial number field:
- TBPBB-39AAA-Q9AEA-G79JA-3BS3D-C9EEJ
- Congratulations! You have unlocked FarStone ONE!
For support of this software, please direct your queries to: <http://www.farstone.com/support/products-support.php>

REQUIREMENTS:

- Windows XP, Vista, Windows 7, or Windows 8
- 512MB hard drive space

LIMITATIONS:

- Registration Required. 12 months.
<http://www.farstone.com/software/one.php>

FULL VERSION

ASHAMPOO MEDIA SYNC

File management can be a tedious business. Connect your phone, open an Explorer window, browse to the Camera folder, select the new pictures, copy them

to the right location... Then repeat, with suitable variations, for every device you ever use, every time you plug it in.

Ashampoo Media Sync changes all that. Once set up, it automatically recognises a device as soon as it's connected, then searches the appropriate folders, locates the files you'd like to transfer - documents, music, pictures or videos - and copies anything new to your chosen destination folders, without you having to do anything at all.

REGISTRATION & INSTALLATION:

- Download and run [ashampoo_media_sync_19660.exe](#)
- After you launch the software, a prompt will appear requesting you to register.
- Click on "Get free activation key", this will open up a link in your default internet browser.
- Enter your email and hit the "Request full version key".

REQUIREMENTS:

Windows XP, Vista, Windows 7, or Windows 8
200MB hard drive space

LIMITATIONS:

Registration Required.
<http://www.ashampoo.com/>
NOTE: Users who have previously registered an Ashampoo product, please log in.

Once you have logged in, go back to within the application and click "Request FREE full version key" again and fill out the prompts accordingly.

Copy and paste your license key into the application, press next and complete the installation process.

FULL VERSION

CHECKDRIVE 2015

Modern hard drives are supremely reliable. They may well last the full lifetime of your PC, and even more if you reuse them elsewhere. But there are exceptions, and if you're one of the unlucky ones then a hardware failure could prove disastrous. Which is why you need to monitor your system regularly for any potential problems.

CheckDrive 2015 provides several ways to check your hard drives for signs of poor health. These start with a surface scan, looking for lost clusters or bad sectors which might indicate an upcoming issue that may not be immediately apparent.

REGISTRATION & INSTALLATION:

- Download and install checkdrive_cs_uk_09_2015.exe

REQUIREMENTS:

- Windows XP, Vista, 7 or 8
- 50MB hard drive space

LIMITATIONS:

- Registration Required

<http://www.abelssoft.net/>

NOTE: During our testing of the application, we were not prompted for a registration key. However, we were given the following instructions:

Get your registration code within the application. Note, if you have previously registered an Abelssoft full product, you won't need to register again.

For support of this software, please direct your queries to: <http://www.abelssoft.net/contact>

6 MONTHS OF FREE UPDATES**PANDA INTERNET SECURITY 2015**

Panda Internet Security 2015 is an accurate and reliable security suite, packed with features yet also surprisingly lightweight.

The package opens with a stylish Windows 8-like console, colourful tiles representing each of its many functions and features. The "Scan" tool is sensibly positioned at the centre left where you'll see it right away, and you can have the program running a first check on your system in a couple of clicks.

Panda's cloud technology means a lot of the threat processing occurs elsewhere, reducing demands on your PC's resources. We were able to run other programs without noticing any effect on performance, even with Panda running a full system scan in the background.

The package really is doing solid work, though, and it regularly scores highly with the independent testing labs. AV-Comparatives September 2014 Real-World Protection tests placed Panda a creditable 3rd out of 22, offering 99.5% protection: that was outperforming Kaspersky, Bitdefender and Avira, amongst others.

REGISTRATION & INSTALLATION:

- Download and install IS15.exe
- Congratulations! You have successfully installed Panda Internet Security 2015!
- For support of this software, please direct your queries to: <http://www.pandasecurity.com/australia/homeusers/support/>

REQUIREMENTS:

- Windows XP, Vista, Windows 7, or Windows 8
- 500MB hard drive space

LIMITATIONS:

- 6 months of free updates
- <http://www.pandasecurity.com/>

FULL VERSION**WEBSITE X5 COMPACT V10**

WebSite X5 Compact 10 is an easy-to-use WYSIWYG HTML editor which helps you create stylish and professional websites in just a few minutes.

The program provides a simple wizard to walk you through every step of the design process, from choosing the look of your site, to adding pages, selecting their content, and more. It's all very free form, too. The first step asks you to enter details like your site title and description, for instance, but if you're not sure yet, that's no problem: just choose another step and you can come back later.

REGISTRATION & INSTALLATION:

- Download and install wsx5_cp.exe
- Get your registration code at <http://www.websitex5.com/magazine/pcauthcpt10uk/>
- For support of this software, please direct your queries to: <http://www.websitex5.com/en/index.html/Manuals/>

REQUIREMENTS:

- Windows XP, Vista, Windows 7, or Windows 8
- 200MB hard drive space

LIMITATIONS:

- Registration Required
- <http://www.websitex5.com/en/index.html>

FULL VERSION**WISE CARE 36**

Keeping your computer running smoothly can easily turn into a full time job – that is unless you outsource most of the hard work to a dedicated tool. This is just how Wise Care 365 could help to lighten your work load, making it possible to easily check your system for problems, clean up the registry and drives, as well as boosting overall performance.

REGISTRATION & INSTALLATION:

- Download and install WiseCare365_V3.exe
- No registration required.

REQUIREMENTS:

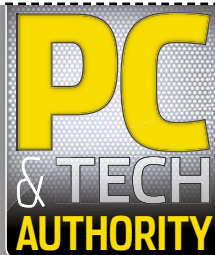
- Windows XP, Vista, Windows 7, or Windows 8
- 500MB hard drive space

LIMITATIONS:

- Expires 31 July 2016.

For support, please direct your queries to: <http://www.wisecleaner.com/help.html>

FREE FULL VERSIONS: Each month, we offer *PC & Tech Authority* readers full registrable versions of some software on the DVD. See the installation instructions in the DVD menu to complete registration, if applicable. **IMPORTANT:** Full product registration closes on 07/09/15



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FEATURE + FARSTONE ONE + ASHAMPOO MEDIA SYNC + CHECKDRIVE 2015 + PANDA INTERNET SECURITY 2015 + WEBSITE X5 COMPACT V10 + WISE CARE 365 **DRIVERS** + ATI CATALYST + NVIDIA FORCEWARE **HELP** + DISCLAIMER + DAMAGED OR FAULTY DVDS + USING THIS DVD + INSTALLING SOFTWARE **EDITORIAL** + BURNING AN ISO IMAGE + PC&TA EDITORIALS **TROUBLESHOOTING** + SERIAL CODES + BLANK REGISTRATION WEBSITE + CAN'T FIND A FILE? + INSTALLATION ERROR **WINDOWS** + CCLEANER + CLASSIC SHELL + CUTEPDF + DEFRAGGLER + FOXIT READER + GREENSHOT + APPLE ITUNES + LIBRE OFFICE + OPEN OFFICE + MALWAREBYTES' A/M + SANDBOXIE + VLC MEDIA PLAYER + FLUX + 7ZIP **MAC** + ALFRED + BETTERTOOLSTOOLS + APPLE ITUNES + DROPBOX + FLUX + GOOGLE CHROME + MOZILLA FIREFOX + PLEX + SKYPE + TEAMVIEWER + VLC **INTERNET** + VUZE + DROPBOX + GOOGLE CHROME + MOZILLA FIREFOX + MOZILLA THUNDERBIRD + SKYPE + STEAM **LINUX** + CLONEZILLA LINUX

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JON HONEYBALL

"I'M GOING TO STICK MY NECK OUT AND SUGGEST THAT MOVING ONTO WINDOWS 10 SOONER RATHER THAN LATER WILL PAY OFF"

Windows 10 is a much cleaner, more coherent OS than Windows 8 or 8.1; even business users should be getting ready to make the leap

The rush to get Windows 10 ready for release continues apace.

It's only a few weeks until the planned escape of the product, and there's still much to be done – in fact, there's too much being changed in these last moments to make me feel entirely comfortable. However, launching anything of this size is always going to be a massive undertaking, and it's easy to forget just how complex a process it is. Am I still confident about Windows 10? Yes, but I'll confess still somewhat guardedly. It's definitely so much better than Windows 8/8.1 that any comparison feels unfair; I can't wait to move all of my desktop test computers in the lab onto Windows 10 and be able to put the nightmare of 8/8.1 behind me. I hated the bizarre thinking behind Windows 8 from the start, and 8.1 helped only partially. Windows 10 is like a welcome breath of fresh air.

However, I'm concerned by the number of businesses still content with Windows 7 64-bit (not that there's much wrong with that; it works very well, in the same way that XP worked so well in the business environment for so long). Getting businesses to make the transition to Windows 10 will be critical for Microsoft, since the company needs to reduce the spread of versions of its platform out in the wild. Another area that's giving me concern is the speed of both upgrading and updating. I'm finding that these Fast-ring interim builds are taking a long time to install, and continue to be plagued by those old Microsoft bugbears – fuel gauges of task completion that linger around like limp corpses but suddenly leap into life,

or that crawl to some arbitrary amount and then hop straight to 100%.

As part of my self-cleansing from Windows 8.1, I upgraded a stock Toshiba Ultrabook that I bought about a year ago – a moderately nice, thin device that I haul around in my travel rucksack whenever I need to take a Windows laptop alongside my usual MacBook Pro. It's never been particularly great at running Windows 8.1, always feeling just a little bit underpowered; a seven-stone weakling, to misquote Charles Atlas. Upgrading it to the current 10 build took a while – enough time to watch a full-length feature film – and the subsequent upgrade to the latest Fast-ring build took another Hollywood blockbuster's worth. While I'd like to point the finger at the Toshiba, I've seen the same performance when running in a VM on my Mac Pro, which is hardly short of horsepower. Hopefully there's something here that can be tuned to be significantly faster before product release.

The overall experience of Windows 10 on my Toshiba is much better than

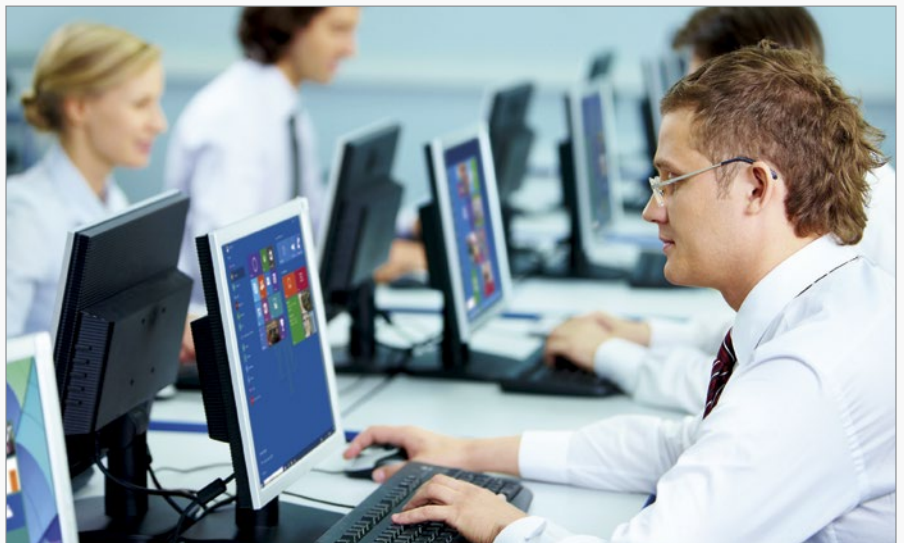
8.1, feeling cleaner, more coherent and logical. All those nonsense Charms – and the other items that might have made some sense on a touch tablet – have disappeared when operating in Desktop mode on a proper laptop. Upgrading the Toshiba to Windows 10 has worked well overall, and I can't imagine anyone currently on 8.1 wanting to stay there, given that Microsoft is making it free for home users to make the switch.

Business users will need to consider carefully how and when to upgrade as part of their upgrading and management process, but – while it's rather tempting to suggest that anyone running Windows 7 in a business should stay with it for the time being, on the principle of "better the devil you know" – this time I'm going to stick my neck out and suggest that moving onto Windows 10 sooner rather than later will pay off. Don't forget that despite all the desktop nonsense of 8 and 8.1, there was clearly a stronger and more secure core OS at its heart, and this continues with Windows 10.



JON HONEYBALL

Jon is the MD of an IT consultancy that specialises in testing and deploying hardware
@jonhoneyball





△ Microsoft's Project Oxford includes a facial-recognition API

The evolution of Internet Explorer is a rallying cry to developers: build to current web standards and do it now. We must put the horrors of Internet Explorer 6 firmly behind us. There are still far too many company intranets that run hack-o-matic HTML, and other bits of lash-up code lurking around on company networks – a thorough cleansing is now well overdue.

PACKET SIZES

Here was a curious thing: my Mac Pro workstation was generally operating just fine, but couldn't connect reliably to a few specific websites; it didn't matter whether I was using Safari or Chrome, the problem remained. A Windows VM running on the same machine didn't have the issue, however, which was truly strange. It pointed to something in the base OS X operating system – but only on that machine, and not on others that had the same DHCP settings! It was particularly annoying because one of those sites was Adobe Creative Cloud, which meant that I couldn't update the Adobe software on this Mac Pro – every attempt to connect just resulted in a time-out.

It took some digging to unearth the answer. At some point, I'd manually overridden the MTU packet size value of 1,500 with a jumbo packet size of 9,000. I'd been playing around with some NAS boxes and experimenting with jumbo packets, then had of course forgotten to reset this value to the default. I should have done this experiment on a separate Ethernet interface, but fiddling fever had gotten the better of me. Although everything worked on the LAN, and

the firewall was happy enough to send out these fragmented packets, some website servers weren't so happy about handling them.

I'll confess I'm no expert on this level of TCP/IP plumbing, and nor should anyone need to be, unless they're involved in the careful tuning of large LANs. But it was interesting how almost every site was fine, apart from those few that didn't work. Returning the MTU size to normal resulted in immediate and solid connections to Adobe and all the others. As always, fiddling with these things is fine, provided you remember to undo what you've done: just because everything seems to be working doesn't mean you can neglect resetting everything. Sometimes I'm my own worst enemy – but at least I'll own up to it when it happens.

CISCO CLOUD STUFF

On the subject of firewalls, I've been doing some rethinking at the office about our firewall and Wi-Fi infrastructures. We've tended to use Apple AirPort Extreme devices for a while, along with a few Netgears and some from other vendors. Especially when we're dealing with a leading-edge technology such as 802.11ac, there can be some odd interactions that can be traced back to the base station, and so having a few alternatives is often a good thing.

Apple's base stations are supposed to support up to 50 concurrent devices, and the other vendors make similar claims. However, I'm somewhat sceptical about these claims. Get a dozen devices onto a Wi-Fi base station, even if they're doing minimal work, and

you'll see all sorts of weird blocking, slowdowns, disconnects and so forth. This applies in the home environment, too. It's especially insidious there because you might have acquired a range of Wi-Fi-enabled devices such as cameras and smart TVs, and hence increased your connection count

“Monthly or quarterly firmware updates don't cut the mustard any more”

without really giving it much thought. The move towards the Internet of Things (IoT) will only make this problem worse, of course.

I've also become somewhat wary about firewalls. At the office we have a very expensive industrial-strength firewall, which was one of the few that was actually able to cope with a 100MB/sec in/out internet connection when I bought it around four years ago. Other vendors' kit, despite claiming adequate throughput, seemed to choke when given any real work to do. I pay an annual fee of several hundred pounds to receive the latest firmware for this device, and have to say that I do trust it. However, I can't shake off the fear that the toxic environment of today's internet is such that monthly or quarterly firmware updates don't cut the mustard any more, especially if they have to be applied manually. Surely we need something more proactive in this space?

After I'd talked to specialists in the field, it became clear that others are thinking the same, but have found the manageability of both Wi-Fi and firewalls to be a problem that increases almost geometrically with complexity. Most of these conversations seemed to come back to the Cisco Meraki range of products.

Meraki was acquired by Cisco a few years ago, and is notable for its cloud-managed devices: you get one dashboard for all your devices, presented in a clear and coherent fashion. All devices receive cloud-pushed updates, and configuration and management promise to be a breeze. Better still, there are useful capabilities such as simple site-to-site VPN tunnelling built in. I've ordered three of these firewalls for my three sites, and four of the Wi-Fi base stations. I've been promised that configuration of the real units will take only a few moments, and that management will be equally quick. If so, I'm really looking forward to them, because the current generation of



traditional firewalls are almost, but not quite, as nasty to configure and manage as VoIP phones. They really do take the biscuit when it comes to sheer hostility. Next month I hope to update you about what happened, but it's already clear that a cloud-managed and controlled infrastructure such as that offered up by Meraki is the best way forward.

The prices aren't too horrendous; they're affordable even in the context of serious home networks. I think we place far too little weight on the real issues raised by home network routers and prefer to turn a blind eye to their security issues. I've raised this before, but industrial-strength firewalls – coupled with clean ease of use and management – should be more than just a pipe dream for home users. This is especially true if you're serious about IoT and having ever-more enabled devices continue to arrive in your home.

MICROSOFT'S PROJECT OXFORD

Praise is due to companies such as Microsoft and Google for opening up more and more capabilities to developers, especially in areas where it simply isn't possible to do anything equivalent yourself. Take a look at Microsoft's "Project Oxford", which is a collection of cloud-based technologies in the field of machine learning. Currently there are four main areas – Face, Speech, Computer Vision and Language Understanding. Taking these in turn, the Face APIs can take an image and work out where the human faces are in it, and also take a guess at whether those users are male or female. The system highlights the eyes, noses and mouths in the images that you load into it, and its success rate is very high.

Speech lets you convert text to speech in a natural-sounding way, and can also convert speech back to text. An additional advanced feature is converting speech to text with intent: in Microsoft's words: "This is similar to Speech Recognition. With Speech Intent Recognition, in addition to returning recognised text from audio input, the server returns structured information about the incoming speech so that apps can easily parse the intent of the speaker, and subsequently drive further action."

Image APIs can do a range of things, including analysing an image to create properly adjusted thumbnails for it based on its content. In addition, it can provide sophisticated filtering to remove content such as pornography; it's used in the Content Moderator service to alert you to inappropriate imagery on your network, and even to work in the space



^ Apple has reduced the vertical movement of the keys on the MacBook's keyboard, which feels rather odd

of images of child exploitation. Finally, the Language Understanding Intelligent Service (LUIS) lets you use natural language within your applications, with commands tailored to your own needs. This can help Bing and Cortana to understand commands such as "set an alarm for 8am" or other items that may well be application-specific.

All these services are currently free, and you're encouraged by Microsoft to incorporate them into R&D work that you're building yourself. There's no indication yet of pricing for this technology, but I think it's fair to assume that if Microsoft does charge for it, the pricing will be vastly less than anything you could implement yourself using more traditional tools. These sorts of high-power cloud-based services are exactly where the cloud excels, and it's good to see Microsoft pushing forward with such capabilities for the wider developer community.

MACBOOK, USB TYPE-C AND THUNDERBOLT

The new MacBook is intriguing me. I bought it to have a good poke around, to see what Apple had managed to do with its leading-edge engineering this time. There are some things about this product that I love: its thinness, its lightness and its display. The keyboard is a curate's egg: Apple has deliberately reduced the vertical movement of the keys on its keyboard, which could have resulted in a very odd action. I'll confess that it does feel rather strange, but it's more to my liking than I'd feared. That's because there's a clearly defined over-centre motion resistance to each keystroke, with a solid bottom end point. I can see that many people will not take well to this keyboard action at all, but I found myself typing away at high speed and with full confidence within a few minutes. While it isn't as good as a proper IBM-style desktop keyboard from the 1990s, almost nothing is.

The USB Type-C port really interested

me, too, because Apple has never been shy about implementing new emerging standards – it was, after all, one of the first firms to put the original USB into a computer. With Type-C it has leapt in with both feet and remarkable confidence. I like the Type-C connector, which demonstrates exactly what's been wrong with USB up until now, and brings in the useful parts of Lightning too. Indeed, its data capabilities are such that it arguably eclipses both Lightning and Thunderbolt in one swoop, especially following Intel's announcement that Thunderbolt 3 will actually be a superset of USB Type-C. Finally, we have one plug that can do it all, and it's been better designed than the nonsense that is USB, and the issues of mini- and micro-USB, both of which are utterly hateful connectors.

The Type-C connector appears to be able to deliver huge amounts of power too, as well as bleeding-edge data rates for 5K monitors and the like, so I think we might be onto a winner here. However, the MacBook has only a single port, and it's normally used for battery charging. If you want to connect up a "legacy" USB device, you'll need to spend more money on an adapter. I'd have been impressed if Apple had bundled one of these with the MacBook for free, especially given the high price tag of even the basic MacBook. But no, it's an extra cost.

Of course, it's a brand-new world for Type-C devices, and things will change rapidly over the coming months. I think Apple has identified an interesting market for this new MacBook, namely people who want the lightness and portability of an iPad but with the power and flexibility of a real keyboard and full-power OS. I'm typing this on a new 13in MacBook Pro that I recently bought in New York, after unwisely setting off for a business trip without my normal laptop; while I love the power and connectivity of the MacBook Pro, the smaller and lighter form factor of the MacBook has a certain appeal. Does the MacBook set a new design reference for truly portable Ultrabooks, a new class of super-ultraportable? I think it does, and I suspect Apple will be walking away from the MacBook Air range soon. It did its job, but engineering has moved on.

One last thing – on the MacBook Pro 13, I find the screen size to be wrong for me, so I've been into the Settings app and changed the scaling from the default to the point between "Default" and "More Space". The screen is of high enough quality to support this, and the result is a better working space on the screen, more akin to a 15in display. Try it – it might work well for you too. ●

PAUL OCKENDEN

"IMAGINE LIVING IN A HOUSE WITH A SINGLE LIGHT SWITCH – ONE WHERE ALL THE LIGHTS GO ON AND OFF TOGETHER"

Such a system would be bonkers – so why do so many “smart” heating systems operate in this way? Honeywell offers something truly clever

This month, I'm mostly going to be writing about central heating. Don't worry, the printers haven't accidentally slipped a page from Plumber's World into your magazine – this is central heating with a hi-tech twist.

You've probably heard of Google's Nest thermostat, or the Hive system promoted by British Gas, both of which allow you to control your heating remotely from your smartphone. There are other players in this market, too: Tado, Inspire, Netatmo, PassivSystems – the list goes on, with new competitors popping up on the various crowdfunding sites on an almost weekly basis.

Most of these devices are designed to replace the traditional thermostat, and will usually supplement it with a little added intelligence, perhaps setting different temperatures at various times of the day, or allowing you to turn the heating on and off from your phone while you're out and about. Some will even “learn” how you live your life and start adjusting the stored schedule to match.

I'm not a great fan of such learning systems. If your life is fairly structured, it's easy to create a schedule to match, but a learning system won't stand a chance if you're more chaotic – if you take a couple of days off work, for example, it will think that's your new daily routine.

I much prefer a system where you can override a fixed weekly pattern for specific events such as bank holidays, sick days and the odd week away – perhaps with added automation to cope with exceptionally hot or cold days, and maybe some geofencing so that you don't heat an empty house but always return to a warm one.

All the systems I've listed have one thing in common. As with traditional heating thermostats, there's a single controller, with one thermostat covering your whole house. Just think about that for a moment. Can you imagine living in a house with a single light switch? One where all the lights go on and off together?

For starters, it would be an incredible waste of energy – you'd be lighting rooms that weren't in use. It would also be uncomfortable, since the person cooking in the kitchen under bright lights would inconvenience those trying to watch TV in the dimly lit living room or sleeping off a migraine in a blacked-out bedroom. A single light control would be bonkers, so why are we prepared to put up with a single control for our heating systems?

Okay, thermostatic radiator valves (TRVs) can help, but they just set a target temperature for each room; they have no idea whether that room will be occupied at certain times of the day, or on certain days of the week. If you want your bedroom to be nice and toasty when you get out of bed in the morning, a TRV will keep it at that temperature all day. We

spend a fortune on energy-saving light bulbs to reduce our electricity bills, but lighting accounts for less than 10% of the energy costs in a typical house. Heating and hot water usually make up more than 80% of the bill, so that's where we need to look for improvements and savings.

IN THE ZONE

The best way to achieve this is through zoning: that is, splitting your home into separate areas so that each has its own heating schedule. Some upmarket homes come with such systems in place, with valves near the boiler opening and closing as required to heat different zones. If you live in a more traditional house, however, perhaps with an ancient boiler and hot-water setup, it's possible to retrofit a zoning system. Usually this works by replacing all your radiator valves with intelligent controllers, so that various “setpoint” temperatures can be sent to each device at different times of the day.

There are several such systems on the market, although many suffer small

✓ The Evohome controller is the heart of the heating system



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niggles that work against them. Some require a wired connection to every radiator valve, which is bonkers in this day and age. Others employ one-way communication from a central controller to their radiator controls, simply sending the setpoint temperature. The problem here is that the system doesn't know when the whole house is up to temperature and all of the valves have closed, so the boiler continues to churn away wastefully.

After a lot of research, the system I eventually chose for my own house was Evohome from Honeywell. This consists of a central controller device and others that you fit to each radiator, plus a few optional bits and bobs.

Why did I choose Evohome over the other systems? Well, mainly because it's a mature system. The Evohome controller is now into its third generation – although it's actually older than that, since its roots lie in an earlier system called Hometronic. Even Honeywell's radiator controllers are now second-generation, whereas newer competitors are very much version 1.0, with the associated problems that version 1.0 devices suffer.

The Evohome controller is at the heart of the system. It talks wirelessly at 868MHz to all the other components. These can be sensors (such as thermometers) or actuators (such as relays, and valves that turn radiators on and off). Some devices contain both: as well as turning radiators on and off, the TRVs also contain a temperature sensor.

The communication between most nodes is two-way, which is important for two reasons. First, it means that local changes on any TRV or room thermostat will be reported back to the Evohome controller. Second, devices can report their demand for heat, so the boiler need only fire up if at least one radiator (or other heat source) is calling for it. Evohome is therefore ideally suited to older properties with old-fashioned boilers and radiators, although it can also cope with underfloor heating and electric heat sources. If you have a system with a stored hot-water tank heated indirectly by your boiler, it can even control that.

Let's take a more detailed look at each of the components of this system. The controller is a 140 x 100mm box with a 4.25in colour touchscreen. This allows you to view and control the temperature of every zone (you can put several rooms into the same zone) and your hot water too. Different target temperatures can be set for various times of each day. And you can override the temperature in any zone, and several "quick actions" are available to turn down the whole house by a few degrees, for example, or set the system



"Heating and hot water make up more than 80% of the energy bill, so surely that's where we need to look for improvements and make savings"

into "working from home" mode, where it treats a weekday as though it were a weekend.

There are two mounting options available for the controller: there's a tabletop stand, or you can attach it to a wall. It contains a rechargeable battery, so the unit can be removed from the wall or table for short periods, but it will start to beep at you if you keep it away from the mains supply for too long.

Until recently, controlling your heating and hot water via an app on your smartphone or tablet required an Internet Gateway Device that connected to your broadband router. However, the latest version of the Evohome controller no longer requires this gateway; it talks to your router via Wi-Fi.

The smartphone and tablet apps

< The Evohome app gives you full control of your heating while out and about

largely mirror the facilities available via the Evohome controller, although they don't talk directly to the device – everything goes via a US-based cloud service. In addition, APIs are available that let you write scripts to monitor and graph the temperature in the various rooms of your home, and even control those temperatures. (I'll cover how to do this in a future column.)

You'll need to control the heat source in each room – in most cases, a radiator – by using HR92 controllers. If you already have thermostatic radiator valves, you can simply remove their existing heads and replace them with the HR92. Most brands of TRV are supported, although a few will require an adapter.

The HR92 senses the temperature in the room – it's designed to measure the temperature of the updraft that occurs around the edge of a room – and tries to maintain the set temperature by opening its valve proportionally, not just on or off, and demanding heat from the boiler if needed (more on that in a moment). There's a large LCD panel on each HR92 that displays the current set temperature for that zone; you can change this to show the room temperature instead. A rotary dial lets you override the temperature set by the Evohome controller; such local adjustments will apply until the next scheduled temperature change.

I've been impressed by how well isolated the temperature sensing of these HR92s appears to be, considering they're attached to hot pipes and sit next to huge heaters. Even when a radiator is extremely hot, the white body of the device seems to remain at room temperature.

Also impressive is their battery life: despite all the mechanical opening and closing, RF comms and LCD-panel updates, two standard AA alkaline batteries will last around two years (you'll receive a notification on the Evohome controller when they need to be replaced). If you have underfloor or electric heating, there are other options available, but since I have neither I can't comment on them in a real-world sense.

MULTIPLE SOURCES

You might have multiple heat sources within a zone, and Evohome provides some flexibility with regards to how these are treated. Each can work in isolation, or one radiator (or other sensor) can become a master, controlling all the radiators and other heaters. The latter is the default behaviour, and it sometimes works better if you have an open-plan

“Even if you ignore the economics, the big thing for me is comfort; as a result of Evohome, the whole house feels far more comfortable”

space or one large room with several radiators. The former scheme is designed for a single zone that consists of multiple rooms. Having played with both, I reckon that, even for large, open spaces, the multiroom option usually works better.

In situations where you have a radiator behind a sofa or a bed, say, or in a radiator cabinet, the sensor in the HR92 won't give you a true reflection of the room temperature. In this case, it's worth mounting an external sensor in that room.

There are two main options and, as with the radiator controllers, they're wireless. There's a stylish, round, wall-mounted thermostat called the Y87RF and a more utilitarian-looking device known as the DT92E. Both have fairly large screens that display the current room temperature. With the Y87RF, you can adjust the zone temperature up or down by rotating a large bezel around its display, while the DT92E employs more conventional push buttons. In fact, it goes two steps further than its more stylish

✓ The HR92 will replace the head on most thermostatic radiator valves



cousin by offering an “eco” button, which you can push to change the temperature of the zone for a number of hours (this is performed independently of the eco settings available on the Evohome controller), and a button to switch off the whole zone.

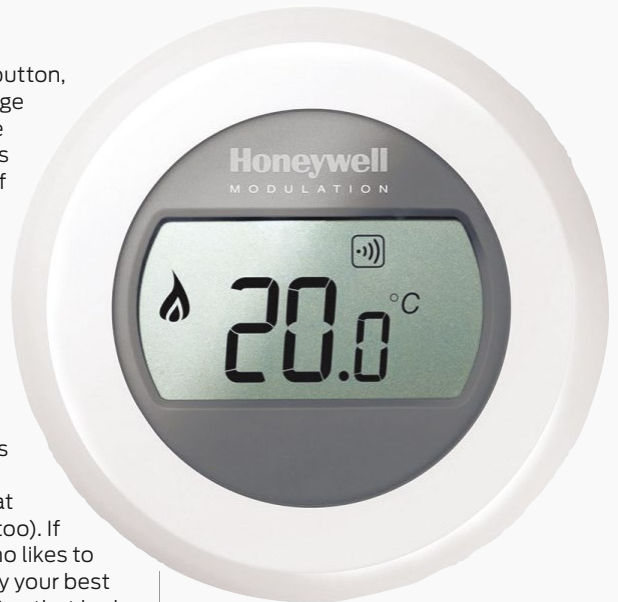
Another advantage the DT92E has over the Y87RF is that it comes with a table stand as well as a wall mount, whereas the Y87RF is wall-mount only (it comes with screws and Rawlplugs in the box, but I've found that VHB tape works really well too). If you're the kind of person who likes to fiddle, the DT92E is probably your best bet, but if you want something that looks stylish on the wall then I'd recommend the Y87RF.

When it comes to how the system interacts with the boiler, there are a few options. My house has what's known as an S Plan heating and hot-water system, in which there are separate motorised valves for the heating and hot-water circuits; a feed from each of them fires up the boiler once its valve is fully open. With a conventional central-heating controller, a time clock and a room thermostat would drive these valves.

When retrofitting Evohome, you'll bypass the clock and thermostat and feed power to the two-way valves via a small wall-mounted relay box known as a BDR91. This is a receiver that takes commands from the Evohome controller whenever heat from the boiler is needed, either to heat a room or for hot water. (Incidentally, the temperature of the hot-water tank is sensed using yet another battery-powered wireless sensor.)

I have 14 radiator valves in my house, plus both types of room stat, a hot-water sensor, two BDR91s and the Evohome controller itself. You'd think this would cause a lot of RF energy to fly around, and that there would be either interference or collisions, but this isn't the case. The RF side of things has been designed to work on the 1% principle – 1% communication, 99% silence – and the timings of the various devices are staggered so that there's never any noticeable wireless congestion. I've watched these comms using my trusty RF Explorer (as described in several previous columns), and they all seem to occur quickly.

So, the big question: is it worth it? Fitting an Evohome system isn't cheap, but neither are fuel prices. Honeywell reckons the system will typically save you around 40% on your fuel bills. It's



△ The Y87RF is a stylish, wall-mounted thermostat

too soon to know whether or not this is accurate in my case, but the boiler definitely isn't firing up as often, or for as long, as it used to. Plus, I'm not heating unused rooms, so I'd expect the payback time to be quite rapid.

Even if you ignore the economics, the big thing for me is comfort. With my old system, a radiator would either be going at full blast or stone-cold, and room temperatures would cycle too. As you walked around the house, there would be pockets that were too warm or too cold. Evohome has changed all of this. Radiators are now warm – just warm enough to hold each room at the temperature requested – and there's no more noticeable heating up and cooling down as the heating cycles on and off. Because of this smoother control, I'm able to set a lower temperature than before, knowing it will never fall below this level. As a result, the whole house feels far more comfortable.

My system was installed by an accredited installer, but there are places online that will sell you the bits if you want to install the system yourself. There's no plumbing involved, unless you don't already have TRVs. You might need a sparky to wire up the BDR91s if you're scared of electricity, though. I'd recommend an installer, but make sure you quiz them on how many similar systems they've fitted, since Evohome is relatively new.

It's all a very interesting project and I expect a few surprises – good and bad, so over the coming months I'll report on how my system is working, as well as covering how to extract and chart data, and the additional levels of control available by interfacing with third-party apps and systems. ●



OLIVIA WHITCROFT

"IF TERMS ARE FAR REMOVED FROM REALITY, THEN THIS DEFEATS THE PURPOSE OF HAVING A WRITTEN AGREEMENT AT ALL"

Think you're immune to website hacks because you have some technical knowledge? As this tale of WordPress woe demonstrates, no-one is safe...

Picture the scene: it's 1993 and the forward-thinking telecommunications manager at Big Industry Ltd has decided that this new-fangled email communication will be good for business. He clears it with the operations director and before long they've decided upon a provider.

Initially, email will be set up on one PC for one user, but if all goes well, the intention is to roll it out across other company computers. Practicalities such as phone lines and modems are discussed, fees and setup dates agreed, and then the small matter of a contract is raised. The company requires all providers to sign up to its standard terms, and it's explained to the provider that a few additional provisions are required for these types of services, including responsibilities for the phone/internet line and so on. The contract is drawn up and sent to the provider for review.

Casting his eye over the document, the provider soon realises that he's been presented with a contract for fax-machine maintenance, complete with response times for fixing hardware faults, paper and ink-cartridge replacement. He raises these concerns with Big Industry and is told that it will accept a few tweaks, but there's no time for lengthy negotiations or for a new contract to be drawn up. The provider signs the contract and the parties move forth into the unknown territory of providing email within a framework of fixing fax machines.

This isn't a true story, but it represents the frequent disconnect between the terms of technology contracts and the services that are being provided. This is

emphasised by the rapid development of technology, presenting new environments for delivering services and new opportunities for business collaborations. Insufficient time and resources are allocated to producing a bespoke contract, so providers are presented with "standard" terms. These are generally used for more established methods of service delivery, but are felt most appropriate to match the context. They range from something slightly inappropriate to complete nonsense: as in my example above, it really can be the difference between provision of email services and fax-machine maintenance.

More up-to-date examples include contracts for face-to-face or web delivery of services, where in reality they're being provided over a mobile app; or end-user agreements for technology services, where in practice the services are being resold. Software development agreements often don't reflect intended use of source code or copyright. Contracts involving use of customer

✓ Check those Ts&Cs carefully before you sign a cloud contract, because who knows where your data will be stored?

terms may fail to achieve any of these. The most they may do is meet internal administrative requirements.

SO WHAT?

Of course, the parties may carry on their relationship in harmony regardless of the written terms. So, all may be well. However, sooner or later, one party may want something to be done or may dislike something that the other party has done, and will refer to the agreement. At this point they'll discover that the terms say something different, haven't covered the issue, or don't really make sense.

Both parties could then agree to amend the contract to fix the problem, or find a practical way forward, and this may resolve matters. However, if they remain in disagreement, they'll want to rely on the existing terms to protect or defend their position. Unfortunately, the legal position with those terms may be extremely hazy!

Taking one extreme, the agreement may be enforceable as it stands; in other words, the parties will need to comply with the terms as written, even though they both had something else in mind. This may happen where the contract is disadvantageous for a party, but isn't too far from the core intention. At the other extreme, the agreement may be ineffective due to a mistake or lack of certainty. This is generally unhelpful for both parties, but may result in one side being put at a greater disadvantage.

Where possible, a court will try to construe the wording of a contract in a way the parties intended, or may infer terms to give effect to that intention. Or, if a party can show there's been a mistake, a court could order the contract to be rectified. This could help, for example, if the word "fax" was used instead of "email" and it's clear the parties meant "email". However, giving new meaning to the terms is unlikely if the terms can reasonably be given their ordinary



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meaning, or if they're far removed from reality; a party is unlikely to provide evidence of completely different terms having been agreed.

Unsuitable terms can also cause compliance problems or have knock-on effects on other relationships. For example, it can be a breach of data-protection law not to impose security obligations on a service provider, and ineffective assignments of copyright may mean intended onward licences to others are ineffective.

As can be seen, resolving the consequences of inappropriate terms can be time-consuming and costly, and even then may not achieve the desired result for either party. It's much better to get the terms right from the start.

WHAT CAN BE DONE ABOUT IT?

The overall message isn't new: a contract needs to be tailored to the context of the intended relationship. As new technology inspires creative services and methods of service delivery, customers and suppliers also need to be creative with the terms governing their relationships. Standard terms can be useful for the basics, but bashing out terms to apply unamended to all technological scenarios is unlikely to be achievable.

The argument against this approach also isn't new. Getting external lawyers involved can be costly; getting in-house lawyers involved for each project can be time-consuming. Standard terms and procedures help to keep control of legal risks within the available resources and budget. Each new relationship may not justify the time and costs involved in

producing a "perfect" contract.

However, this doesn't mean that a middle ground can't be reached, showing some flexibility in approach. If time and resources are limited, a shorter agreement may be an option, with a clear description of the intended relationship, but without addressing every scenario. This is likely to be better than a mesh of terms that sound good legally but are potentially useless in practice. A more all-encompassing agreement could then be produced at a later date if things go well overall.

If terms are added to address a new technological issue, remember also to adapt the terms that are already in there. The repeated addition of new layers of terms often results in overly complex contracts. For example, new terms may be added relating to online delivery of digital content without removing terms about physical delivery. The intentions may be good but, before long, the simplest route forward may be to rip up the contract and find a blank piece of paper to start again.

Effective communication can also reduce the time involved in getting the terms right. This includes input from those who understand the technology, and appropriate lawyer-to-lawyer discussions. It may sound crazy, but contracts aren't just for the lawyers – the terms should ideally be read and understood by commercial and technical teams as well.

WHAT HAPPENED NEXT

Let's pick up our story from where we left it in the early 1990s, with Big

Industry starting to use email. There soon followed business networks and websites, and into the late 1990s e-commerce became the big thing. Search engines became sophisticated, websites started to interact with customers, and digital content became

"Contracts aren't just for lawyers – the terms should be read and understood by commercial and technical teams as well"

an alternative to physical equivalents. Employees were becoming more mobile; laptops replaced desktops, mobile phones were standard issue, and they could dial up to the work network from home. Psions and PalmPilots went into pockets or handbags. The "tele" was slashed from the telecommunications manager's job title.

In the noughties, dial-up was soon replaced by broadband, and PDAs by BlackBerrys to access email on the move. Pretty soon competitors had arrived on the scene offering smartphones and tablets. Moving into the current decade: VoIP, webinars and social media became established business tools; apps started to challenge websites and other traditional methods of service delivery.

Alongside all this, IT services and licensing models were changing. Software downloads were superseding floppy disks and CD-ROMs, and open source was added to the mix in development projects. Alternatives to traditional IT outsourcing were evolving, moving through application service providers and reaching cloud computing in the 2010s. Infrastructure-, platform- and software-as-a-service started being provided using intricate partnership and subcontracting models.

Just over 20 years down the line from introducing email, Big Industry is now looking into BYOD, Big Data, the Internet of Things, 3D printing and augmented reality. Big Industry's relationships with its providers and partners continue to evolve to capture these new opportunities. All it has to do is ensure that its contracts with these parties continue to evolve as well.

If all you have is standard terms, everything looks like a fax machine.

The above commentary provides general information on the subject matter and is not intended to be relied upon as legal advice.●



DAVEY WINDER

"SECURITY THAT ISN'T IMPLEMENTED, OR ISN'T IMPLEMENTED PROPERLY, IS AS MUCH USE AS A CHOCOLATE PADLOCK"

However, the solution needn't be complex or expensive. The credit-card-sized Qwertycard may be all you need

For the longest time, the advice was never to write down passwords.

There was good reason for this, namely that the key to your network was often found dangling from your monitor on a sticky note. Then things changed, and everything needed a password – so many passwords, in fact, that for many small businesses their security options lay somewhere between “one ring to rule them all” and “write them all down”. The former often took the form of a password vault, in which your written-down passwords are encrypted and stored in a file that requires you to remember only one super-strong password to open it.

I said “somewhere between” there, because two problems arise from this multiple-password mess we find ourselves in today. First, there's the temptation to cut down on the number by sharing the same passwords between several sites and services, the consequences of which are obvious and oft-exploited – an attacker who compromises one login has a good chance of compromising the others too.

Second, and perhaps a little less obviously, many users of password-management vaults soon find themselves back in Post-it note land. This means there's still a chance someone could find that sticky, connect it to your vault file and hence gain access to everything. However, in the modern working age it appears to be the best option.

There is a third way. You can keep multiple passwords – the “something I know” in the theoretically perfect identity-authentication formula – but add an extra layer of “something I have”, which is how two-factor authentication (2FA) works.

This requires not only a master password to achieve stage one, but also a token to complete stage two: that token could be in the form of a code sent to your mobile phone via text message or one created by an app. Or, it could be a physical token that generates a one-use code on the fly when it is plugged into your machine.

For some time now I've recommended to both consumers and small-business users that a combination of password-vault management and 2FA is the way forward. I have first-hand experience of small-business clients whose data integrity has been preserved by the adoption of 2FA security following the breach of a third-party service. Unfortunately, not all third-party services

it finds it time-consuming, confusing or overly expensive then it's less likely to get used. Security that isn't implemented, or isn't implemented properly, is about as much use as a chocolate padlock.

Qwertycard recognises this and turns the security proposal on its head, making it as simple as it can be. It's a credit-card-sized item that slips into your wallet/purse and has your password printed on it in a way that can't be deciphered by anyone other than you.

The Qwertycard is well named: it comes in the form of a printed black card with a white Qwerty keyboard on it. Below the keyboard is a spacebar on which you'll find printed some random characters. And that's it, apart from the seemingly counter-intuitive (when it comes to

security) instructions printed on the reverse: “space bar code + your secret + site name”.

The spacebar code contains at least one number, one lower-case letter, one upper-case letter and one non-alphanumeric character

to ensure all Qwertycard passwords meet the minimum criteria across most sites and services. This code is the first thing you'd type when entering a password into an online service, exactly as it is printed on the card. So in the screenshot (see opposite) that code would be wKjH!0\$Y, which isn't the easiest string of characters to remember, and that's the point. It contains random character combinations that make it harder to crack than dictionary words or supposedly random words that aren't: most random words you come up with won't be truly random, whereas this one is created using a random code generator to do a slightly better job.

The people behind Qwertycard selected code characters from 80 of the characters found on a standard keyboard, excluding a small number considered to look too similar or potentially confusing for users. Obviously, every Qwertycard has a unique spacebar code printed on it,

“Qwertycard provides a low-rent yet secure method to both create and remember complex passwords”

will offer 2FA. In fact, scrap that, not all the services you use that are password-protected will offer 2FA. And while I remain convinced that, where 2FA is available, it's common sense to employ it, where it isn't available I'm going to rip up the rulebook and go all old school with some contradictory advice: write your password down. Not only that, but keep it with you in plain sight so you don't forget it.

While I have you totally confused I'll also thrown in this extra corker: reuse the same password across all your logins. Of course, all this isn't as chaotic and insecure as it may first appear, and I most certainly haven't lost the plot; instead I've found a remarkably simple and elegant solution to one part of the secure-password puzzle, called Qwertycard (qwertycards.com).

In the world of security, the paradox rules supreme. You might think that the more complex and ingenious the solution the more secure it will be, but that doesn't allow for the fact that if the person using



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▲ Qwertycard, the new old-school way to protect passwords by writing them down

and the digital versions of both data and codes are securely erased as soon as the card itself has been physically printed. What's more, I'm assured that no record is kept anywhere to link each customer's order to the cards that were shipped to them. Instead, every card is shipped with a covering letter that contains the only copy of its Qwertycard code as a backup – and hence a potential weak point in the password security chain; you must store this securely (my inner cynic wants to suggest a password vault would be a good place).

CODE CREATION

Okay, putting irony to one side for now, let's move on to the next part of your Qwertycard password-creation system, namely your secret word. This is something that only you know; you can make it as long as you like. It doesn't need to be overly complex or composed of special characters, upper- and lower-case and so on, although once again the security geek in me wants to suggest that it would make sense to create it in that format. Not least because it's just this one word, so if you keep its complexity simple (if you see what I mean) it will increase the overall strength of the passwords you end up creating.

So, for example, instead of using "JeanClaude" as your secret word (that's the name of my van in case you're interested) you might use "Je@nCl@ude". That's no more difficult to remember once you have it in your head, but as part of a more complex character string it makes cracking the whole thing much harder. Make your secret word something that isn't easily guessed, though; here the name of my prized van probably isn't a great choice!

If you want to be sneaky with your secret word, why not encode the word

using the Qwertycard itself, as you must do with the site name? "JeanClaude" would then become "lq,6GS,6pq". This word is then used as the middle part of all your passwords, which still makes Qwertycard appear pretty insecure when you consider that it's now using something printed on the card itself plus a word that's shared across every site or service you use.

The final piece of the code-creation jigsaw may not seem to add much to the security either, since it's just a code created by the cipher keyboard visible on the card. However, cards come with different ciphers and the site name you choose doesn't have to be an obvious one. So instead of using "eBay" to create a code of "q5,6", you could use "Auction", which gives "6goVP6". I wouldn't get too paranoid, since this part of the password system is really just to ensure that you have truly unique passwords for each service, to prevent online attackers from easily guessing them. Once you have all three parts of a password in place it becomes both complex and strong, yet at the same time easy to use and remember.

Qwertycard is cheap – at US\$4.99 per card – and safe enough, when used properly, to increase security wherever 2FA isn't an option. Even where 2FA is available, Qwertycard provides a low-rent yet secure method to both create and remember complex passwords.

I'm not going as far as to suggest that Qwertycard is the holy grail of consumer/ small-business security. It patently isn't, and there are some rather obvious weaknesses. The three biggest are: it reveals part of your password, which makes it less work for someone to crack the remainder; it creates more work if you ever need to change your password, whether following a security breach or for housekeeping purposes; and some websites disallow certain characters that the Qwertycard will want to use.

Of all these, the last is my biggest concern. After all, the success of Qwertycard hinges largely on its ability to generate complexity without making the user experience too nasty, so anything that diminishes both at once needs to be taken seriously. As a pragmatic workaround, the folk behind Qwertycard suggest that you manually substitute allowed characters (normal alphanumeric ones) for the disallowed ones for those sites only. This does deal with the usability issue, but at the cost of complexity. Thankfully, fewer and fewer sites are imposing insecure restrictions over character types and password lengths, so this may soon become a problem of the past.

The password length will vary, depending upon your secret word and the site name you use – as will its randomness

– but typically you're going to be looking at a password string in the region of 20 characters or more. And what if you need to change a site's password regularly? There's no ideal solution, only another workaround, namely to add the month in a three-letter format, encoded of course, to your secret word. This wouldn't show the month in plain text, so if a password were compromised on the site, it wouldn't be obvious what you were doing.

I feel compelled to throw in that you could print your own version of a Qwertycard for next to nothing. When I spoke about Qwertycard to a local small business – and by small I mean fewer than six employees – they could see its benefits, but were put off by the perceived complexity of managing it at their own business level (where their IT department is a woman called Shirley who opens the mail and also makes the tea). A valid concern, although the cards are so easy to understand and implement that staff "training" is a doddle.

Management can be as simple as keeping those master letters stored securely, although a better option would be to scan them and then burn them, keeping the digital versions in an encrypted format, enabling some on-wards management capability if the "secret word" is added. Of course, Qwertycard's model isn't really aimed at the serious end of the business market, and nor would you expect it to be, but as a partial solution to many of the problems I'm seeing in the real world at a more macro-business level it surely deserves some serious consideration.

MY LITTLE GOOGLE

Google comes in for a fair bit of stick. The social media world accuses it of not really being a serious player with Google+, and those on the more accusatory side of the privacy debate regard it as something of a Data Dyson, sucking up all the information it can about everybody and everything.

For once, though, I won't be beating Google with its own "don't be evil" commandment, but rather applauding it for following Facebook's lead. How so? Well Facebook has faced up to its privacy critics by introducing a central security settings interface, where everything privacy- and security-related can be configured. Now Google has caught up, with its "My Google Account" interface. It's early days yet, but a quick play with the control panel suggests that it's a big step forward in security strength. The inclusion of privacy and security checkup systems, with step-by-step guides that handhold you through their options, is a real advance and one I suggest that everyone, no matter how secure you feel, should take. ●



STEVE CASSIDY

"HOW MANY OF THE WORLD'S TOP 500 FASTEST COMPUTING FACILITIES ARE CRAY SHOPS? (ANSWER: 28%)"

With high-value orders still coming in – are the services of this supercomputing veteran worth it?

What would you pay for a Cray supercomputer, today? Yes, that would have been a silly headline, but hear me out. I appear to have attracted the attention of the supercomputing crowd after writing about my encounters with IBM's Watson, which led to an invitation to the offices of Cray Inc (founded 1972).

The firm is presently located in the smoking-hot tech hub that is Bristol, England, and it's not only there to churn out racks full of standard components with vinyl stickers covering their standard tin. This is Cray Computers, dammit, the inheritor of Seymour Cray's mighty brand and pioneering attitude to very high-performance computing. The firm was only too pleased to make a proper splash when opening this new office, which isn't here only to support the recent (and impressively pricey) purchase of \$100 million's worth of kit by the British Met Office. No, Cray has development and implementation projects running out of Bristol in which American staff take orders from British global project leaders.

Whoa, headspin moment – this definitely is not a PC company. Cray's roots stretch back to the early 1970s, when it created the key inventions and algorithms that made supercomputing viable, and which still give it an edge today. These aren't like my friends in the Fens, who distribute racks of top-end supermicros that can be built into supercomputers. This isn't a hot startup that stuffs all your data in the cloud and mumbles about scale-up versus scale-out – Cray's president, Peter Ungaro, dismissed my cloud questions as quickly as he could without being rude. He knows that for real supercomputing you keep the brains and the storage close, linked

by the fastest communication fabrics; you don't leave them dangling at the end of dubious, inconsistent internet pipes. His interest lies in how many of the world's top 500 fastest computing facilities are Cray shops (answer: 28%). Nowadays, quite a few of these top 500 are evangelising a "build it yourself from plain white boxes" approach, but Peter and his team are quite clear about what buying Cray adds to that basic, building-blocks outlook.

SUPERDOLLARS

If you need to know how much such machines cost, the answer is that you probably can't afford one – prices start at half a million dollars. Now I'm going to forswear the usual attempt to crunch such huge numbers down to the everyday scale, but I'll just mention that last time I saw someone put together a "white box" commodity supercomputing environment, comprising two fairly full racks, they paid just over \$600,000.

The basic Cray is a rapidly mutating beast, but I just managed to grab a fleeting reference on one of the firm's slides to "Haswell", which pegs these boxes as being out of last year's Intel parts catalogue. That passing moment made it sound as if "Cray" was just a sticker, using the same chips everybody else has in their far cheaper platforms. (I did notice stickers on the lids of the entirely standard laptops visible on the Cray office desks, which read "My other computer is a Cray" – and no, I didn't manage to snaffle one.)

Now I realise there are lots of folk who fervently, even obsessively, believe that the cheapest and most straightforward server designs are just as fast and long-lived as the machines made by their more ambitiously priced competitors. I'm reminded of cheery blogs from the early days of Linux in academic institutions that showed dumpsters full of retired "Windoze"

workstations being reincarnated as bizarre (but very fast) Beowulf clusters of mismatched bits. I'm sure this kind of experiment has been repeated several times, with the final results being trumpeted as victories for penniless geniuses who need to run some vast compute-pool task – and, while they're at it, to take side-swipes at the massive inefficiency of the Windoze environment.

However, when I watched a real supercomputer being specified, ordered, built up and run, the relationship between this and "commodity" hardware (stuff I could grab online in a few minutes and expect delivered the same week) was tenuous to say the least. If you stretch the definition of "commodity" to include precisely matched, leading-edge, fully populated rack-dense machines interlinked by state-of-the-art InfiniBand crossbar interconnects, then I suppose this is commodity of a kind.

This stuff had to come all the way from Japan, and had very grumpy requirements for such things as IP address ranges and access to the internet – none of which I'm used to seeing even with enterprise-grade machines operating as compute servers, never mind commodity-grade ones.

Cray struggled with my questions about this. Mr Ungaro was polite, but was clearly distracted by the non-technical



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> The classic Cray X-MP/48: an iconic supercomputer design





mission of making The Hon Edward Henry Butler Vaizey MP, HM Minister for Culture, Communications and Creative Industries – alongside local Bristol dignitaries – feel welcome. The Rt Hon Ed's speech was great fun, actually, very much in the Boris style, but it wasn't really about anything technical; more about how to set up your hi-tech business. It also gave me a good 15-20 minutes to look around the room and figure out what I was seeing, and hence formulate some more apposite questions – once the painful business of tape-cutting and standing holding the strip of the local football team had come to an end. No, I didn't understand that bit either.

WHAT IS IT GOOD FOR?

Things became more technical in direct proportion to the degree of relaxation and the amount of champagne consumed: the Met Office chaps talked about their \$100 million order, although, once again, this was more about "what it does" than "how it does it". I know from a previous life hanging around the edges of the insurance business that there's a huge market for more accurate weather forecasts from business users – farmers are merely the tip of this iceberg. The Met

✓ Peter Ungaro, CEO of Cray, quickly dismissed my questions on cloud computing



Office boss pointed out that in a single severe weather event – those St Jude's Day storms that I remember clearly – the money saved by emergency services by being in the right places (and not the wrong ones, such as near the sea, or on top of a hill), and by various commercial operators not sending out trucks to suffer nasty weather-related crashes, was already enough to pay for this new

"The more calculations he can cram into the interval between a buoy bobbing up and down and rain smacking my windowpane, the more accurate his warnings will become"

machine. That's not money saved in a year, it's money saved in that single event – most reassuring if you were thinking that \$100 million is a lot of money.

The interesting point about this \$100m in particular – according to his forecast-versus-actual graphic – is that the extra horsepower it buys makes today's three-day forecast as accurate as a one-day forecast of around ten years ago. So in this very specific field I have an equally narrow answer to that question with which I started the column: he'd pay whatever they ask for this Cray computer, and for the next one, because the more calculations he can cram into the interval between a buoy bobbing up and down and rain smacking my windowpane, the more accurate his weather warnings will become.

But why go to Cray – a company with traceable chunks of intellectual property that date back to 1972 – to spend such cash? If you're just crunching petaflops, then you could simply sit down with a spreadsheet and a parts catalogue and

< Cray's XC40 is powered by Intel Xeon CPUs – but is a world removed from a regular server

build your own, right? Anything else would just be the Apple Tax writ larger, money grabbed from people not smart enough to get the same thing for less...

Er, not quite. First of all, the building-blocks method of buying commodities rests heavily on an assumption that there are no bottlenecks in the architecture, and no limits to the ability to compute. This is an assumption I've seen manifestly disproved many times over, even before straying into supercomputer land. I also started to recognise a common theme from all the case studies that the Cray guys and their assembled customers offered: it's all about vectors or, in more modern cases, graph theory.

QUESTION PHRASING

I'm not aiming to summarise this entire branch of mathematics, but I'd just like to point out a very subtle distinction between looking for a shape you already know is in a picture and letting that shape make itself known to you. Sound almost mystical? Well, here's one perfectly mundane example of how this kind of maths can achieve results from a pool of unstructured data. A particular travel firm had a database of every holiday taken by its German customers. A traditional business-intelligence question may take the form "how many people went to Turkey?", but vector-orientated questions would be more like "which are the fastest-growing destinations?" or "which are the least popular airports?" Graph theory allows data to present emergent behaviours or properties with minimum presumptions on the part of the questioner.

This might feel a million miles from modelling a new jet-engine design, but from the twinkle in the eyes of a few of the Cray engineers I gleaned that it actually might not be all that far – they're all very firmly convinced that you can't get real supercomputer performance from mix-and-match environments.

I rather suspect that these same concepts from graph theory underlie the design of proper supercomputers with tens of thousands of cores. To compute all that data and have the answers thrown back onto some lesser device for you to read, the secret sauce lies in the OS. It's the OS that has to figure out a whole lot of dataflows, quite irrespective of what those dataflows represent. They could be Germans going on holiday; they could be meteorological readings from sensors in the South Pacific; they could be obscure statistics about baseball players



△ 4D-DC has a refreshingly grounded take on the cloud

(one US baseball team uses a Cray that it consults in the short interval between a new pitcher being presented and a batter being chosen to respond – and no, I didn't understand this either).

I suspect the gap in comprehension between Cray as an old-school supercomputer maker and these new plug-and-play evangelists boils down to a very unfashionable word indeed: maturity. Even though almost none of that original 1972 business remains, what has been carried over is far more than all the clever code libraries and approaches to computing, embedded in bits of hardware that don't even get rated in the speed-comparison charts: it's a far longer-term understanding of businesses, too, and of how they may try to use information technology, without some of the sacred cows and crazy constraints of the IT business as we've all come to know it in the early 21st century.

OF CLOUDS AND HOSTS

Oh boy, is Red Hat ever excited about its Cloud Suite for Applications. This is a platform that gets laggy, lazy developers up to delivery speed with whatever funky web widget they're trying to put together, without having to necessarily kowtow to those equally laggy and lazy web hosts, who can't see that the world has changed. Everyone is tearing up even those transformative cloud strategies, which had already torn up the old guard of hosting. Yes I know, after you've listened to too many cloud industry presentations, the words kind of tumble into one

another until you can't identify what they think they're saying, let alone what it might mean for you (the presenters have promoted themselves from merely "excited" – so 2009 – to "super-excited"). That's why it was ideal timing to go straight from the Red Hat briefing over to a far calmer and more down-to-earth chat with David Barker, technical director at 4D-DC (4d-dc.com).

He has a new architecture for hosting, which is why we were chatting, but I was more interested in some counterpoint to the super-excitement of the Red Hat launch. We ended up talking about the way his existing customers had driven his interest in putting the dreaded "c" word into what had been a pretty straightforward hosting and rack-space business.

He was clear about this: while the leading-edge announcements are all very clever (and there's no doubting that, in some distant lands, the high pace of change at work will lead us into a very different web-server world), from his perspective, his clients are much more interested in long-term stability. Where a cloud platform helps with that – for instance, through its ability to move a running VM from a host that develops problems onto one that's working okay – they're exceedingly interested. But go too far with the highfalutin, scalable, transportable, standards-driven, containerised OpenStack-ready blah, and those same customers will just stop listening.

My relief at hearing this verged on the boundless, because that's more or less what I'd been saying earlier that day to

"After you've listened to too many cloud presentations, the words kind of tumble into one another until you can't identify what they think they're saying, or what it means for you"

Lars Herrmann of Red Hat, while he was getting carried away and amazed by the possibilities presented by Cloud Suite for Applications. Unfortunately for my frazzled brain, he grabbed the down-to-earth point and ran with it.

The whole proposition for Red Hat is that asking hassled developers – who have websites they need to bang out – to keep careful track of where the hosting business would like to pigeonhole this or that resource (Is it IaaS? Is it PaaS? Who really cares?) just slows everything down. It makes it much harder for them to prepare their site designs for the brave new world of OpenStack, and that includes the database and the workflow an end user has to undertake, not merely the chunks of Java or CSS sheets or such like. This is where I think Red Hat needs to listen very carefully to people such as 4D-DC's David Barker.

Not once in his positively overbrimming presentation did Lars mention cost, which is a classic omission for a Red Hatter, what with them being so open and all. Neither they nor the bigger beasts they're targeting with this toolbox (AWS and Azure) like to make the pricing of the final, delivered web-commerce application easy to discern during the design or testing phase. The costs will rise as your traffic rises of course, but when your traffic does rise you'll be making more money – so what do you care if the bill goes up, right?

David, as a long-term hosting specialist, knows very well that customers are going to care a great deal about the bill, and many of them don't take kindly to being told they ought to be "more responsive to flexible demand" or some other rapid-fire, cloud-jargontastic nightmare.

Customers are far more likely to choose trailing-edge, simple, predictable products and companies over the big players if they start to get the uneasy feeling that they're being blinded by gobbledegook.

This is a profound truth of the commercial market that both David and I seemed to understand, without having to get "super-excited" about anything. ●



“Scapegoating the robot, and failing to hold the human designers fully responsible”

and failing to hold the human designers, deployers and users involved fully responsible,” he said.

He added that even “if there is a ‘problem with the robot’ (be it faulty materials, a misperforming circuit board, bad programming, or poor design of installation/operation protocols) those faults, and/or not anticipating them, are, in some sense, a case of human error”.

Most academics believed the incidence of accidents involving robots would only increase. “Even if safety standards continue to rise, meaning that the chance of an accident happening in any given human/robotic interaction will go down, we can expect more and more incidents like this to occur in future, simply because there will be more and more cases of human/robotic interaction,” Chrisley said.

“Industrial strength robots can be very powerful and usually have safety protocols. But of course we have human errors in operation or programming as well as break downs and accidents happen,” University of Sheffield Emeritus Professor of AI and Robotics Noel Sharkey said. “We could see many more of these as the current robotics revolution progresses.”

Closer to home, robots are being scapegoated for the effect they will have on Australian jobs. “More than five million jobs, almost 40 percent of Australian jobs that exist today, have a moderate to high likelihood of disappearing in the next 10 to 15 years due to technological advancements,” a controversial Committee for Economic Development of Australia (CEDA) report concluded.

However, as Communications Minister Malcolm Turnbull noted, this is most likely to be the case only if Australians stand still and do not adapt to changes occurring around them. “While many jobs and in some cases entire industries are at risk of being replaced by computers, technology can be harnessed to create a net increase in employment,” Turnbull said. “Our challenge is to ensure that enough Australians have the skills and technological imagination to take advantage of new technologies; to approach disruption as an opportunity to invent and create, and not something that we seek to prevent.”

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ROBOTS MADE SCAPEGOAT FOR VW FACTORY DEATH

Fears for our future are unmatched by reality. By **Ry Crozier**

The death of a contractor assembling a robot in a Volkswagen plant has seen an outpouring of “scapegoating” directed at robots and automation – despite “human error” being officially blamed. The 22-year-old worker was “grabbed” and crushed against a metal plate. The robot was designed to grab auto parts on a production line, according to news reports.

However, academics have taken issue with the accident being branded as a robot “killing” the worker – suggesting that it gives robot technology far too much credit. “It’s important to understand that with present technology we cannot ‘blame’ the robot,” said Dr Blay Whitby, a lecturer in computer science and artificial intelligence at the University of Sussex. “They are not yet at a level where their decision-making allows us to treat them as blameworthy.”

Dr Ron Chrisley, director of the Centre for Cognitive Science at the same university, said positioning the accident as a robot killing a worker was “misleading, verging on irresponsible”. “Despite what one might be encouraged to believe from fiction or recent alarmist worries, [robots] themselves have no real intentions, emotions, purposes, etc,” Chrisley said. “They can only kill in the sense that a hurricane can kill; they cannot kill in the same sense that some

animals can, let alone in the human sense of murder.”

Chrisley noted that robots were likely to face similar instances of blame as their numbers grew. “As robots become more prevalent in society, more and more it will seem like they actually have their own autonomy, allowing them to form their own purposes, goals and intentions, for which they can and should be held responsible,” he said. “Although there may eventually come a day when that appearance is matched by reality, there will be a long period of time, which has already begun, in which this appearance is false. “Robots are not autonomous in this sense, and are not responsible for what they do.”

Chrisley has an academic interest in this early tendency to classify “human-robotic interactions in terms of ‘what humans are responsible for’ vs ‘what robots are responsible for’ – despite the latter class being empty”. “This raises the danger of scapegoating the robot,



TELSTRA WANTS YOU TO HELP RUN ITS NETWORK RY CROZIER ASKS WHEN CUSTOMERS WILL FIGHT BACK

“Telstra is testing just how much of its network it can get away with asking its own customers to run. The carrier joins Optus and other international players in having customers host network access points or become edge sources of network performance data.

The question is: How much of this operation and responsibility for infrastructure can telcos get customers to take on – before they start to fight back? Telstra last year revealed plans to build out a \$100 million Wi-Fi network. After a period of trials, the network was launched last week under the brand ‘Telstra Air’.

While Telstra is deploying about 8000 Wi-Fi hotspots into public areas, it wants to convince up to 1.9 million customers to also host a publicly-accessible hotspot from their house. Customers need a set type of gateway device and a firmware update to enable this to occur. “This update enables your gateway to become a Telstra Air hotspot and broadcast a separate Wi-Fi network alongside your private home network,” Telstra said.

BANDWIDTH SHARING

In other words, customers still have their private home Wi-Fi, but a portion of their bandwidth is made available publicly for other passing Air customers to use. Telstra notes that traffic on the private home Wi-Fi takes priority and can't be overwhelmed by users connecting to the functionally separate Air hotspot.

“We know that Wi-Fi speeds are important to our customers so we have put in place network settings to help protect their home network performance,” a Telstra spokesperson told Information Age. “This includes limiting the number of guests per

hotspot and switching off hotspot sharing when the line speed into a home drops below a certain level. “In addition sharing speeds are capped at 2Mbps per hotspot user.”

OPT-IN

Importantly, Air is also opt-in – meaning Telstra's customers won't be strongarmed into acting as public Air hotspots, should they not wish to do so. While this could limit the availability of Air hotspots compared to Telstra's ambition, it could also save the carrier from a customer revolt.

US carrier Comcast is learning this the hard way. Like Telstra, it wants its customers to hive off some of their home bandwidth to run a public Wi-Fi hotspot that forms part of a nationwide network it is calling Xfinity. However, it did not provide existing customers an opportunity to opt out of the service upon launch – and even seemed intent on making it difficult for still-unwilling customers to turn off Xfinity functionality.

That led to a class action suit being filed in California. Attempts by Information Age to reach the attorneys acting for the plaintiffs in the suit were unsuccessful.

However, one of the sticking points raised in the class action is whether customers should be compensated for the extra power drawn by the home gateway as it serves both public and private users. Speedify calculated that each hotspot could be adding up to \$23 to home

“Customers still have private home Wi-Fi, but a portion of their bandwidth is made available publicly for other passing Air customers to use”

electricity bills – a network running cost that the carrier would have to pick up if it deployed and ran its network equipment.

ROAMING NETWORK SENSORS

It's not just network access points that the telcos want to crowdsource. Two years ago, Optus updated its self-service app to “crowdsource network info” from willing customers and feed it back to the network management team. “The OptusNow app collects feedback on the network, which will help to identify areas to upgrade, [the] location of black spots, mobile phone faults, call dropout locations, [and the] strength of coverage inside buildings,” the carrier said at the time.

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Jon Honeyball will return to Epilog in the next issue of PC & Tech Authority



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Pioneer of Innovative Technology

DreamVision Mini Stick PC

From \$169

RRP Inc-GST

Intel® Atom™
Quad Core

2GB
Memory

Up to 32GB
Storage



- Intel® Atom™ Quad Core processor 1.83GHz
- Intel® HD Graphics
- Windows® 8.1
- Micro SD card slot; Micro USB (charger) / port
- Wireless LAN; Bluetooth; HDMI
- Weight: 46gm

DreamBook M12 Windows 2-in-1 Tablet

From \$399

RRP Inc-GST

11.6" Multi-Touch

Up to 128GB SSD

Windows 8.1 & Office 365



- Intel BayTrail-T CR Quad Core 1.8GHz (Z3735G) Processor
- 2GB DDR3L 1600MHz Memory
- Up to 64GB SSD Storage (eMMC)
- 11.6" TN (1366x768) 5-Point Multi-Touch Screen
- 1080P HD Playback; Micro-SD; Micro USB; Micro HDMI; 2.0MP Front/5.0MP Back camera; 3G (optional)

DreamBook Style W54U

From \$559

RRP Inc-GST

14" Multi-Touch

1x mSATA & 1x SATA

Windows 8.1



- Intel® Pentium® processor
- Up to 16GB DDR3L 1600MHz Memory
- Intel® HD Graphics
- 14" HD (1366x768; 16:9) Crystal Bright Screen
- 9-in-1 Card Reader; 802.11b/g/n WiFi; Bluetooth 4.0; 1.0MP HD Camera; HDMI; USB 3.0

DreamBook Style W65

From \$599

RRP Inc-GST

15.6" HD Screen

1x mSATA & 1x SATA

Windows 8.1



- 4th Generation Intel® Processor
- Up to 16GB DDR3L 1600MHz Memory
- Intel® HD Graphics 4600
- 15.6" HD (1366x768; 16:9) Crystal Bright Screen
- 6-in-1 Card Reader; 802.11b/g/n WiFi; Bluetooth 4.0; 2.0MP HD Camera; HDMI; USB 3.0

DreamBook Power W37

From \$1,299

RRP Inc-GST

17.3" Full HD Screen

1x mSATA & 2x SATA

Windows 8.1



- 4th Generation Intel® Processor
- Up to 24GB DDR3L 1600MHz Memory
- NVIDIA® GeForce® GTX 765M 2GB GDDR5
- 17.3" Full HD (1920x1080; 16:9) Crystal Bright Screen
- 9-in-1 Card Reader; 802.11b/g/n WiFi; Bluetooth 4.0; 2.0MP HD Camera; HDMI; USB 3.0

DreamBook Power P77

From \$2,099

RRP Inc-GST

17.3" Full HD Screen

2x mSATA & 2x SATA

Windows 8.1



- 4th Generation Intel® Processor
- Up to 32GB DDR3L 1600MHz Memory
- NVIDIA® GeForce® GTX 970M 6GB / 980M 8GB GDDR5
- 17.3" Full HD (1920x1080; 16:9) Crystal Bright Screen
- 6-in-1 Card Reader; 802.11b/g/n WiFi; Bluetooth 4.0; 2.0MP Full HD Camera; HDMI; USB 3.0

DreamBook Power P37 SLI

From \$2,999

RRP Inc-GST

17.3" Full HD Screen

2x mSATA & 2x SATA

Windows 8.1



- 4th Generation Intel® Processor
- Up to 32GB DDR3L 1600MHz Memory
- 2x NVIDIA® GeForce® GTX 970M 6GB SLI / 980M 8GB SLI
- 17.3" Full HD (1920x1080; 16:9) Crystal Bright Screen
- 9-in-1 Card Reader; 802.11b/g/n WiFi; Bluetooth 4.0; 2.0MP Full HD Camera; Thunderbolt; eSATA; HDMI; USB 3.0

DreamMicro Power Server 1U D51PS

From \$2,399

RRP Inc-GST

Intel® Xeon® E5 v3

Up to 32GB Memory

4x Hot Swap Drives



- Intel® Xeon® E5-2600 v3 4th Generation Processor
- 4x DDR3L 2133MHz ECC RDIMM slots
- 4x 3.5" Hot-Swap HDD/SSD bays + 2x fixed 2.5" bays
- 1x (x8)+1x (x16) PCIe mezzanine slots
- Intel® I350 dual-port 1 GbE
- 1+1 High efficiency redundant hot-plug PSU

DreamMicro Power Server 2U D51B

From \$2,699

RRP Inc-GST

Intel® Xeon® E5 v3

Up to 768GB Memory

10x Hot Swap Drives



- Intel® Xeon® E5-2600 v3 4th Generation Processor
- 24x DDR3L 2133MHz ECC RDIMM slots
- 10x 3.5" Hot-Swap HDD/SSD bays + 2x fixed 2.5" bays
- 1x (x8)+1x (x16) PCIe mezzanine slots
- Intel® I350 dual-port 1 GbE
- 1+1 High efficiency redundant hot-plug PSU

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TS-851



TS-651



TS-451



TS-251



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